# The McKenzie Institute International

## CENTRE FOR POSTGRADUATE STUDY IN MECHANICAL DIAGNOSIS AND THERAPY

# PART A
# THE LUMBAR SPINE

**Presented By:**

# *Robin McKenzie*

## Founder of the McKenzie Institute International

## *"My patients taught me all I know"*

Robin McKenzie transformed the world of physiotherapy and the care of patients with musculoskeletal problems. He devised a classification system that could be applied to all spinal and non-spinal musculoskeletal problems and was the first clinician to recognise the clinical phenomena of directional preferences and centralisation. He put the patient at the centre of what became known as the McKenzie Method of Mechanical Diagnosis and Therapy. His concepts and clinical teachings, which are supported by strong research evidence, have become established principles in the care of musculoskeletal patients.

He received many honours during his life. Twice decorated by the New Zealand Government, he was also awarded life Fellowship by The Chartered Society of Physiotherapists (UK), the American Physiotherapy Association, the New Zealand Society of Physiotherapists and in 1983 was elected to membership in the International Society for the Study of the Lumbar Spine. What gave him the greatest pleasure however were the many letters he received from around the world from ordinary patients thanking him for their recovery.

Robin McKenzie was also a prolific author. His first book, “Treat Your Own Back”, was written specifically for patients, empowering them to take control of their pain. Other self-treatment books followed as well as texts on the assessment and treatment of the lumbar and cervical spine and the extremity joints.

The McKenzie Institute International continues to expand the delivery of care to patients and the education of healthcare professionals worldwide. There are now branches in 28 countries throughout the world and international courses taught in many more.

Robin McKenzie was a great visionary in the field of musculoskeletal care. His influence continues to grow and his work will forever stand the test of time.

# THE McKENZIE INSTITUTE INTERNATIONAL

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| | |
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## INTERNATIONAL VISION

**MDT to be the first choice worldwide for the assessment, treatment, education and empowerment of patients with musculoskeletal disorders.**

## INTERNATIONAL MISSION STATEMENT

Educate in and promote the principles of the management of musculoskeletal disorders as developed and described by Robin McKenzie.

The Mission shall be achieved by educating and promoting the principles to:

- Administrators
- Clinicians
- Funders
- General Public
- Healthcare Professionals
- Legislators/Policy Makers
- Researchers
- Other

The McKenzie Institute International is a Charitable Trust registered in New Zealand.

# MECHANICAL DIAGNOSIS AND THERAPY

## SEQUENCE OF INSTRUCTION AND TRAINING

Part A
**The Lumbar Spine**
(28 hours)

Part B
**The Cervical and Thoracic Spine**
(28 hours)

Part C
**Mechanical Diagnosis and Therapy Advanced Lumbar Spine & Extremities – Lower Limb**
(28 hours)

Part D
**Mechanical Diagnosis and Therapy Advanced Cervical & Thoracic Spine & Extremities – Upper Limb**
(28 hours)

Credentialling Examination
(8 hours)

Diploma in Mechanical Diagnosis & Therapy

# Table of Contents

***Please note:***
*It is not intended that all the material contained in this manual is covered during the hours of the Part A course. You may be directed by the Instructor to read some of the material and complete some of the Quiz activities in your own time.*

*The order of the delivery of the material may not necessarily follow the order that it is presented in the manual.*

# MECHANICAL DIAGNOSIS AND THERAPY

# PART A – THE LUMBAR SPINE

## COURSE GOALS

As the name implies, this course focuses on the application of the McKenzie Method of Mechanical Diagnosis and Therapy for the Lumbar Spine. Each major subdivision of the course has very specific educational objectives. In general terms, the goals of this course are that you gain knowledge and skills that form the basis from which you may begin to develop your own abilities in applying these principles.

Following attentive participation in, and completion of, this course will provide participants with the introductory knowledge, basic skills and abilities to begin to:

1. Appropriately apply the McKenzie Method of Mechanical Diagnosis and Therapy to patients with lumbar spine symptoms.

2. Distinguish between the McKenzie syndromes (Derangement, Dysfunction, Postural) and the subgroups of OTHER and provide appropriate management regimes for each of the syndromes.

3. Identify when the application of clinician forces are required for the resolution of symptoms using McKenzie's "progression of forces" concept.

4. Assist patients to design and apply the therapeutic processes required to achieve the goals of management.

# MODULE ONE

## INTRODUCTION AND EPIDEMIOLOGY

### Objectives

By participating fully with this module, a participant will be able to:

1. Describe the cardinal features of the McKenzie Method of Mechanical Diagnosis and Therapy (MDT) and contrast it with other management approaches.

2. Describe the major epidemiological factors associated with low back pain.

3. Describe the risk and prognostic factors of low back pain.

# MODULE ONE

## INTRODUCTION AND EPIDEMIOLOGY

**1. Describe the cardinal features of the McKenzie Method of Mechanical Diagnosis and Therapy (MDT) and contrast it with other management approaches.**

**Cardinal features**
- Classification of sub groups (syndromes) - based on symptomatic and mechanical responses
- Focus on centralisation and directional preference
- Self-treatment
- Progression of forces
- Patient education

**Recognises major aspects of back pain experience**
- Recurrent / episodic nature of back pain
- Role of everyday mechanical loading
- Importance of patient involvement in therapy
- Psychosocial aspects of back pain experience

**Contrast with other treatment approaches**
- Repeated movements for assessment and management
- Emphasis on patient independence
- Avoidance of therapist dependency
- Use of minimal intervention
- Combination of exercise and therapist intervention as necessary
- Exercises used for pain relief

**2. Describe the major epidemiological factors associated with low back pain.**

**Prevalence of back pain**
- 50-80% of adult population will experience back pain at some point in their life
- 40% have back pain in any one-year
- Back pain is normal

**The natural history of back pain**
- Considerable variability in natural history
- Recurrent episodes and persistent symptoms are common
- Acute and chronic definitions are insufficient to describe reality of back pain

**Implications of back pain**
- Back pain is one of the commonest causes of disability in working population
- Total costs of back pain are larger than for any other disease for which economic analysis is available
- Medical costs represent 7% to 34% of total societal costs

- 25% to 40% of those with back pain seek healthcare
- Back pain accounts for 3% to 5% of primary care physician consultations

**Management**
Little or no evidence to support the use of:
- Ultrasound, laser, traction, thermal modalities, electrical stimulation, acupuncture, TENS, bed rest for back pain or sciatica, back school in a non-occupational setting.
- NSAIDs provide short-term pain relief in acute back pain, not clearly better than simple analgesics, none proven better. Not proven to be helpful in chronic back pain or sciatica

Some evidence to support a role for:
- Education, behavioural therapy, manipulation – short-term benefit in some sub-groups, and exercise.

## 3. Describe the risk factors and prognostic factors for back pain.

**Risk factors**
Three classes of risk factor:
1. Individual and lifestyle
    - History of back pain
2. Physical or biomechanical
    - Heavy or frequent lifting
    - Whole body vibration (as when driving)
    - Prolonged or frequent bending or twisting
    - Postural stresses (high spinal load or awkward postures)
3. Psychosocial

**Prognostic factors**
- Psychosocial factors have a role in the development of chronic pain and disability.
- Heavy manual work, sitting occupation, low job satisfaction, lower income associated with poor prognosis.
- Leg pain, sciatica, previous back pain, lack of centralisation associated with poor prognosis.

# PREDISPOSING FACTORS

## MCKENZIE IDENTIFIES TWO LIFESTYLE FACTORS PREDISPOSING TO LBP

**These appear to have a close association with the development of back pain but lack support from the literature to date.**

**1. Poor sitting posture**

- Slouched sitting places the spine in flexion and is similar to the fully flexed standing posture.
- In the sitting position the more the lumbar spine approximates kyphosis, the higher the intradiscal pressure; the more the spine approximates lordosis, the lower the intradiscal pressure.
- The slouched sitting position also causes overstretching of posterior spinal ligamentous structures at end range.

*Some LBP is caused and nearly all LBP is aggravated and perpetuated by poor sitting.*

**2. Frequency of flexion**

- From rising in the morning until returning to bed at night people are predominantly in flexed spinal postures and activities, and rarely extend. Frequent and sustained flexion stresses are present during work and during daily activities.

*These two predisposing factors, when combined, eventually lead to a loss of extension.*

# REFERENCES FOR MODULE ONE


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# NOTES FOR MODULE ONE

# MODULE ONE

## Quiz

**Answer the following questions:**

1. What are the characteristics of the McKenzie Method for the management of mechanical LBP?

2. How does the McKenzie Method differ from other treatment approaches?

3. What does the expression 'natural history of a disease' mean? What is the natural history of LBP?

4. What are the implications for society and for the individual of the prevalence of back pain?

5. From the history of the case study provided identify possible risk and prognostic factors.

# MODULE TWO

## PAIN AND CONNECTIVE TISSUE PROPERTIES

### Objectives

By participating fully in this module, a participant will be able to:

1. Identify the structures in the lumbar spine that have a nociceptive innervation.

2. Describe and differentiate chemical, mechanical and chronic pain.

3. Identify and differentiate the various stages of tissue healing applicable to the trauma/recovering trauma subgroup of OTHER.

# MODULE TWO

## PAIN AND CONNECTIVE TISSUE PROPERTIES

### 1. Identify the structures in the lumbar spine that have a nociceptive innervation

- Pain is a sensory, cognitive and emotional experience
- Nociception is the means by which information concerning tissue damage is detected and transmitted to the cortex
- Innervated structures that are possible sources of pain are:
  - the capsules of the zygapophyseal and sacro-iliac joints,
  - the outer part of the intervertebral discs,
  - the interspinous and longitudinal ligaments,
  - the vertebral bodies,
  - the dura mater,
  - nerve root sleeve,
  - connective tissue of nerves,
  - blood vessels of the spinal canal,
  - and local muscles
- Wide distribution of nociceptors throughout the lumbar spine make it impossible to devise testing procedures that selectively stress individual components of the spinal segment
- Kuslich *et al* (1991) has shown that the disc is a possible and common source of back pain.

**Types of pain**

- Somatic – relates to pain derived from any musculoskeletal structure. Somatic referred pain is deep and aching in quality, vague and hard to localise. The stronger the noxious stimulus the further pain spreads down the leg.
- Radicular - relates to nerve root pain. Radicular pain is experienced in the leg. Radicular pain associated with dermatomal pain patterns, abnormalities of nerve conduction such as weakness or paraesthesia, and abnormal tension tests
- Central – pain is facilitated by the central nervous system, often referred to as central sensitisation
- Visceral – relates to pain derived from internal organs

**Nociceptors activated by three mechanisms**

- Thermal
- Mechanical
- Chemical – inflammatory process following trauma or with inflammation / infection

## 2. Describe and differentiate chemical, mechanical and chronic pain

**Key factors in the identification of pain of a chemical nature**

- Constant pain
- Recent onset (traumatic or possibly insidious)
- Cardinal signs may be present – swelling, redness, heat, tenderness
- Lasting aggravation of pain by all movements
- No movement found which abolishes, centralises or makes the pain better.

**Key factors in the identification of pain of mechanical origin**

- Mechanical pain is more commonly intermittent but may be constant.
- Certain repeated movements cause centralisation or make the pain remain better
- Movements in one direction will improve symptoms, whereas movements in the opposite direction may worsen them
- The mechanical presentation will improve as the symptoms improve

**Key factors in the identification of Chronic pain**

- Chronic pain may be influenced by non-mechanical factors
- The link to the original tissue damage may become minimal
- There may be neurophysiological, psychological or social factors
- Length of time symptoms have been present does not mean a mechanical assessment should be withheld
- Some will respond normally, so all should be assessed mechanically
- Response may be more gradual
- Some may not respond to mechanical therapy and may need a more multifaceted approach, including cognitive – behavioural therapy.

**Pain generating mechanisms**

| STATE OF TISSUES | PAIN MECHANISM |
|---|---|
| Normal | Abnormal stress – mechanical |
| Inflamed (acute) | Predominantly chemical – somatic and/or radicular |
| Healing (sub-acute) | Chemical / mechanical interface |
| Abnormal (structurally impaired) | Mechanical – somatic and/or radicular |
| Abnormal (derangement) | Mechanical – somatic and/or radicular |
| Persisting hypersensitivity (chronic) | Peripheral / central sensitisation |
| Barriers to recovery (acute to chronic) | Psychosocial factors |

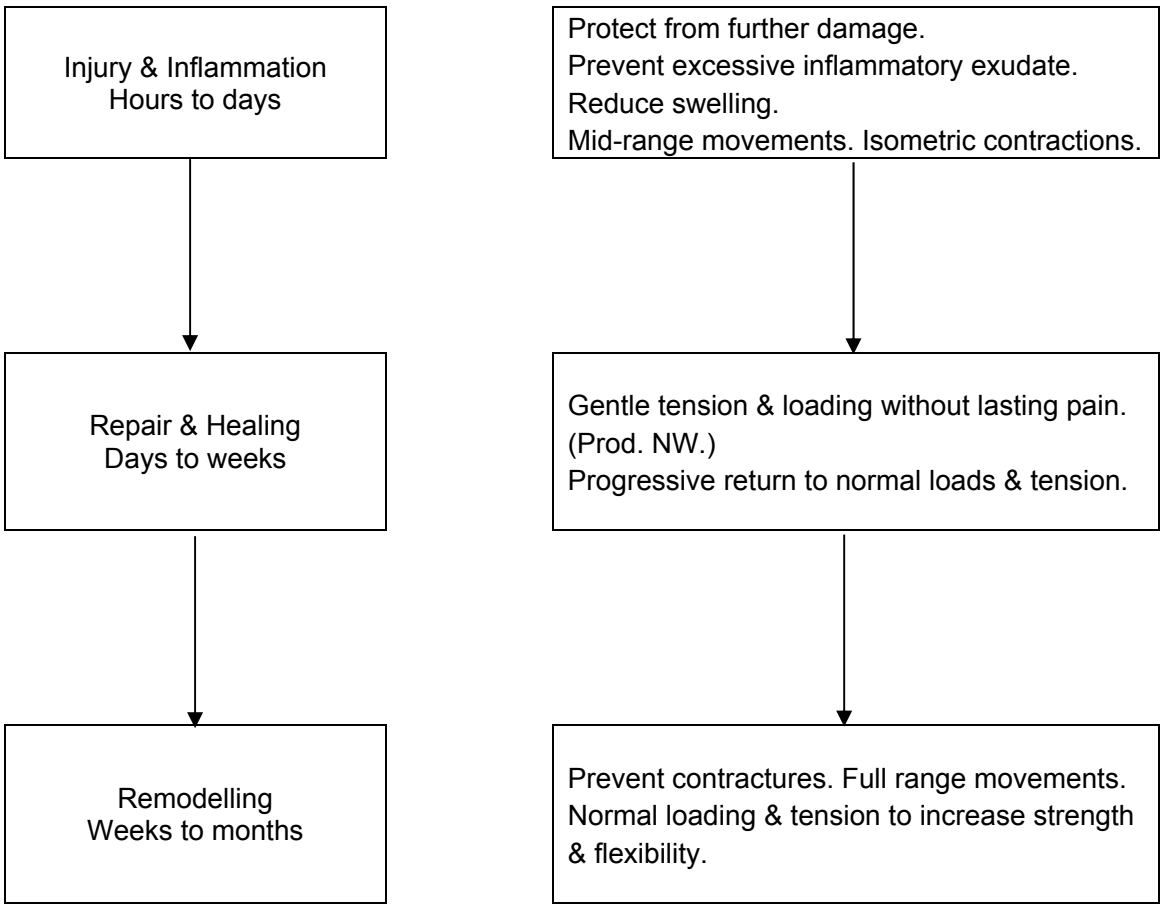
**3. Identify and differentiate the various stages of healing applicable to the trauma / recovering trauma subgroup of OTHER**

**Repair process**

Following tissue injury recovery is divided into three overlapping phases:

- Inflammation – Hours to days
- Repair – Days to weeks
- Remodelling – Weeks to months

## MATCHING THE STAGE OF THE CONDITION TO MANAGEMENT




Failure of any of these processes may result in inadequate or ineffectual repair leading to either chronic pathological changes in the tissue or to repeated structural failure.

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## NOTES FOR MODULE TWO

# MODULE TWO

## Quiz

**Complete the following chart:**

| | CHEMICAL PAIN | MECHANICAL PAIN |
|---|---|---|
| **Caused By** | | |
| **Quality** | | |
| **Constancy** | | |
| **Duration** | | |
| **24 Hour Cycle** | | |
| **Aggravating Factors** | | |
| **Easing Factors** | | |
| **Effect of Medication** e.g. NSAID | | |
| **Treatment** | | |
| **From Case Study – List Indicators of Chemical / Mechanical** | | |

# MODULE THREE

## MECHANICAL DIAGNOSIS
## CLASSIFICATION AND DEFINITION OF TERMS

### Objectives

By participating fully in this module, a participant will be able to:

1. Identify and discuss indications and contra-indications for MDT.
2. Describe the clinical characteristics of the Derangement Syndrome.
3. Describe the clinical characteristics of the Dysfunction Syndrome.
4. Describe the clinical characteristics of the Postural Syndrome.
5. Describe the clinical characteristics of Spinal OTHER.
6. Differentiate between Derangement, Dysfunction, Postural and OTHER.

# MODULE THREE

## MECHANICAL DIAGNOSIS:
## CLASSIFICATION AND DEFINITION OF TERMS

**1. Identify and discuss the indications and contraindications for mechanical therapy**

- Less than 15% of back pain can be given a specific diagnosis
- Classification systems use non-specific labels e.g.
  - Quebec Task Force (QTF) – pain patterns
  - Agency Health Care Policy and Research (AHCPR) and Clinical Standards Advisory Group (CSAG) use:
    - serious spinal pathology
    - nerve root problems
    - mechanical back pain

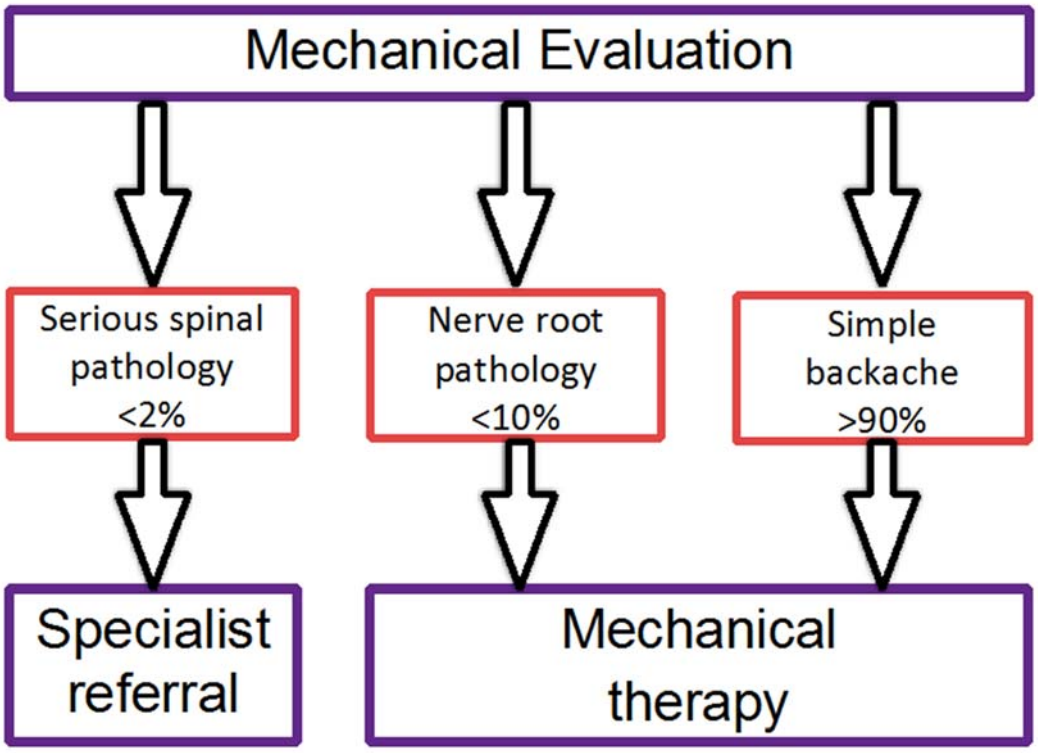
**Indications for MDT**

- Nerve root problems
- Mechanical back pain
  - Mostly aged 20-55 years at onset
  - Lumbosacral region, buttocks and thighs
  - "Mechanical" in nature, that is the pain varies with physical activity and over time
  - Patient is generally well

**Contraindications for MDT**

- Serious spinal pathology
- Cauda equina, cancer, cord signs, infections, fractures, widespread neurological deficit
- The literature suggests the incidence of these is < 2%

**INITIAL MANAGEMENT PATHWAY - KEY CATEGORIES**




**2. Describe the clinical characteristics of the Derangement Syndrome**

**THE DERANGEMENT SYNDROME**

Derangement Syndrome is a clinical presentation associated with a mechanical obstruction of an affected joint. Directional Preference is an essential feature and Centralisation is an important phenomenon observed in the spine.

**Features of Derangement**

Derangement is the commonest of the three mechanical syndromes. Inconsistency and change is a characteristic of Derangement. Its clinical presentation is variable;

Pattern in the history:

- Location of pain may be local, referred or radicular or a combination
- Symptoms may move from side to side, proximally and distally
- Symptoms may be constant or intermittent
- Therefore they are variable during the day and over time
- Pain may arise gradually or suddenly, often with an insidious onset
- Onset may be accompanied by sudden disability
- Symptomatic and mechanical presentations are influenced by postural loading strategies during activities of daily living
- Movements and postures cause symptoms to increase/decrease, centralise/ peripheralise, produce/abolish

- Sustained postures and activities can rapidly and progressively worsen or improve the severity and spread of pain
- May have history of previous episodes

Pattern in the examination:

- Mechanical presentation always includes diminished range or obstruction of movement
- May include temporary deformity, e.g. kyphosis, lordosis, lateral shift
- May display deviation of normal movement pathways.
- Loading strategies can cause lasting changes
- Repeated movements cause symptoms to produce/abolish, increase/decrease, and pain to centralise/peripheralise
- Repeated movements cause increase/decrease in range of movement

In the Derangement Syndrome forces must be applied that achieve reduction, and in doing so these loading strategies will centralise or make symptoms remain better.

*The most common reason for patients to seek assistance is as the result of Derangement – this is the entity that is most commonly seen in the clinic.*

**DEFINITION OF TERMS:**

**Centralisation**

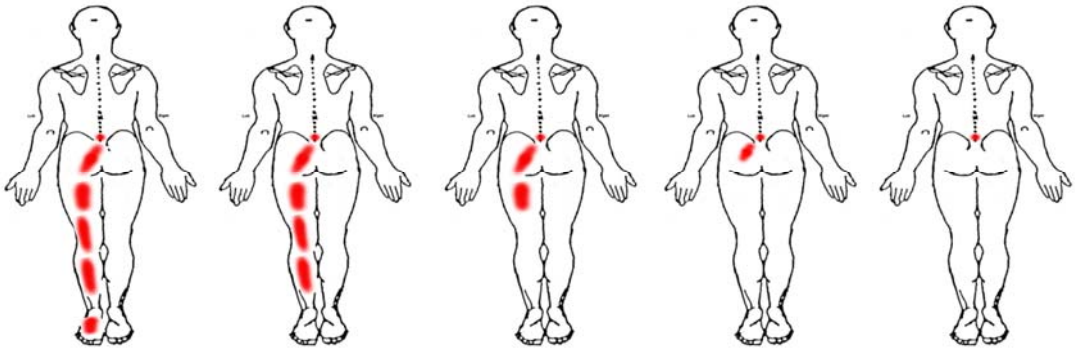
- **Centralisation** describes the phenomenon by which distal pain originating from the spine is progressively abolished in a distal to proximal direction. This is in response to a specific repeated movement and / or sustained position and this change in location is maintained over time until all pain is abolished. As the pain centralises there is often a significant increase in the central back pain**.** If back pain only is present this moves from a widespread to a more central location and then is abolished.

- **Centralising** means that during the application of loading strategies distal pain is being abolished. The pain is in the *process* of becoming centralised, but this will only be confirmed once the distal pain remains abolished.

- **Centralised** means that as a result of the application of the appropriate loading strategies the patient reports that all distal pain has abolished and now the patient only has back pain. The central back pain will then continue to decrease and abolish.

Characteristics of Centralisation

- Only occurs in Derangement Syndrome
- Occurs in response to loading strategies (repeated movements or postures)
- Is usually a rapid and always a lasting change in pain location
- Can be reliably assessed



**Peripheralisation:**

- **Peripheralisation** describes the phenomenon by which proximal symptoms originating from the spine are progressively produced in a proximal to distal direction. This is in response to a specific repeated movement and / or sustained position and this change in location of symptoms is maintained over time. This may also be associated with a worsening of neurological status.

- **Peripheralising** means that during the application of loading strategies distal symptoms are being produced. Symptoms are in the *process* of becoming peripheralised but this will only be confirmed once the distal symptoms remain.

- **Peripheralised** means that as a result of the application of the inappropriate loading strategies the patient reports that the distal symptoms that have been produced remain.

Characteristics of Peripheralisation

- The lasting production of distal symptoms
- Occurs in response to loading strategies (repeated movements or postures)

**Directional Preference**

- Directional Preference describes the clinical phenomenon where a specific direction of repeated movement and / or sustained position results in a clinically relevant improvement in either symptoms and / or mechanics though not always the Centralisation of the symptoms. It is an essential feature of the Derangement Syndrome.

**Differences between Centralisation and Directional Preference**

Directional Preference encompasses a broader range of responses than Centralisation. **Centralisation** refers to the lasting change in the location of pain as a result of loading strategies, whereas **Directional Preference** results in a lasting improvement in symptoms and / or mechanics though not always a change in location of pain. Thus all centralisers have a directional preference **But** not all those who have a Directional Preference are centralisers.

**Characteristics common to Centralisation and Directional Preference**

Who do they occur with?
- Occurs in Derangement Syndrome
- Occurs in both acute and chronic patients

What do they occur with?
- Occurs with specific repeated movements or sustained postures
- Occurs most commonly with extension
- Occurs less commonly with lateral movements or flexion

What are they accompanied by?
- Are accompanied by improvements in mechanical presentation

What do they indicate?
- The classification of Derangement
- The correct movement / sustained position for management
- A good prognosis
- Failure to achieve indicates poor prognosis

**Descriptions of Derangements**

**Posterior Derangements –** this term is used to describe spinal Derangements that have a directional preference for extension procedures / positions.

**Anterior Derangements –** this term is used to describe spinal Derangements that have a directional preference for flexion procedures / positions.

Some Derangements have a directional preference for combined directions and are described accordingly e.g. postero/lateral, antero/lateral.

**Pain Locations of Derangements** – The location of pain in Derangements is categorised under three headings:

- Central or Symmetrical
- Unilateral or Asymmetrical above the knee
- Unilateral or Asymmetrical below the knee

## Deformities Observed in the Lumbar Spine

Kyphotic Deformity
The patient's lumbar spine is positioned in flexion and the patient is unable to extend.

Lordotic Deformity
The patient's lumbar spine is positioned in extension and the patient is unable to flex.

Lateral Shift Deformity
The patient's trunk and shoulders are positioned laterally in relation to the pelvis and the patient is unable to correct the shift.

### Lateral shift

**Right and left lateral shift**

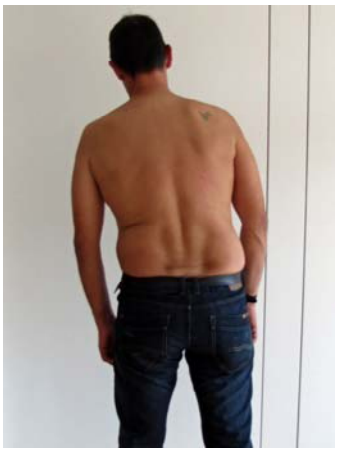
- A RIGHT lateral shift exists when the vertebra above has laterally flexed to the right in relation to the vertebra below, carrying the trunk with it. The upper trunk and shoulders are shifted to the right.
- A LEFT lateral shift exists when the vertebra above has laterally flexed to the left in relation to the vertebra below, carrying the trunk with it. The upper trunk and shoulders are shifted to the left.

**Contralateral and ipsilateral shift**

- CONTRALATERAL shift exists when the patient's symptoms are in one leg and the shift is in the opposite direction. For instance, right leg pain with upper trunk and shoulders shifted laterally to the left.
- IPSILATERAL shift exists when the patient's symptoms are in one leg and the shift is to the same side. For instance, right leg pain with upper trunk and shoulders shifted laterally to the right.

**Criteria to establish the clinical relevance of a lateral shift**

- Upper body is visibly and unmistakably shifted to one side
- Onset of shift occurred with back pain
- Patient is unable to correct shift voluntarily
- OR, if patient is able to correct shift they cannot maintain correction
- Correction affects intensity of symptoms
- Correction causes either centralisation or worsening of peripheral symptoms



## 3. Describe the clinical characteristics of the Dysfunction Syndrome

### THE DYSFUNCTION SYNDROME

Pain from the Dysfunction Syndrome is caused by mechanical deformation of structurally impaired soft tissues. This abnormal tissue may be the product of previous trauma, or inflammatory or degenerative processes. These events cause contraction, scarring, adherence, adaptive shortening, or imperfect repair. Pain is felt when the abnormal tissue is loaded. Articular or contractile structures can be affected – the former is most common in the spine (described below). When affecting articular structures, it is characterised by a painful restriction of *end range movement.*

Pattern in the history:

- History of trauma, derangement, or years of poor posture or degenerative changes
- Present for at least 8-12 weeks
- Pain is Always local except in the case of an Adherent Nerve Root (ANR)
- Pain is ALWAYS Intermittent and produced only when loading structurally impaired tissue
- Symptoms cease when loading is ended, and the pain never lasts

Pattern in the examination:

- Consistent direction and amount of movement produces pain
- Restricted movement(s) in one or more planes
- Appropriate repeated movement will produce symptoms, which do not remain worse

## 4. Describe the clinical characteristics of the Postural Syndrome

### THE POSTURAL SYNDROME

Pain from the Postural Syndrome is caused by mechanical deformation of soft tissues or vascular insufficiency arising from prolonged positional or postural stresses affecting the articular structures or the contractile muscles, their tendons or the periosteal insertions. *N*o pathological changes occur in this syndrome. Patient's with Postural Syndrome rarely present for treatment in the clinic, but the prevalence is high in certain populations groups – students.

Pattern in the history:

- Usually young
- Sedentary lifestyle
- Time is an essential causative factor
- Symptoms always local and intermittent
- But may have simultaneous cervical, thoracic, and lumbar pain
- Brought on only by prolonged static loading of normal tissues
- No pain with movement or activity
- Most common provocative posture is slumped sitting

Pattern in the examination:

- Poor posture – forward head posture, increased thoracic kyphosis, reduced lumbar lordosis
- Posture correction abolishes
- No loss of movement
- Repeated movements have no effect
- Pain produced / abolished on static tests

## 5. Describe the clinical characteristics of Spinal OTHER

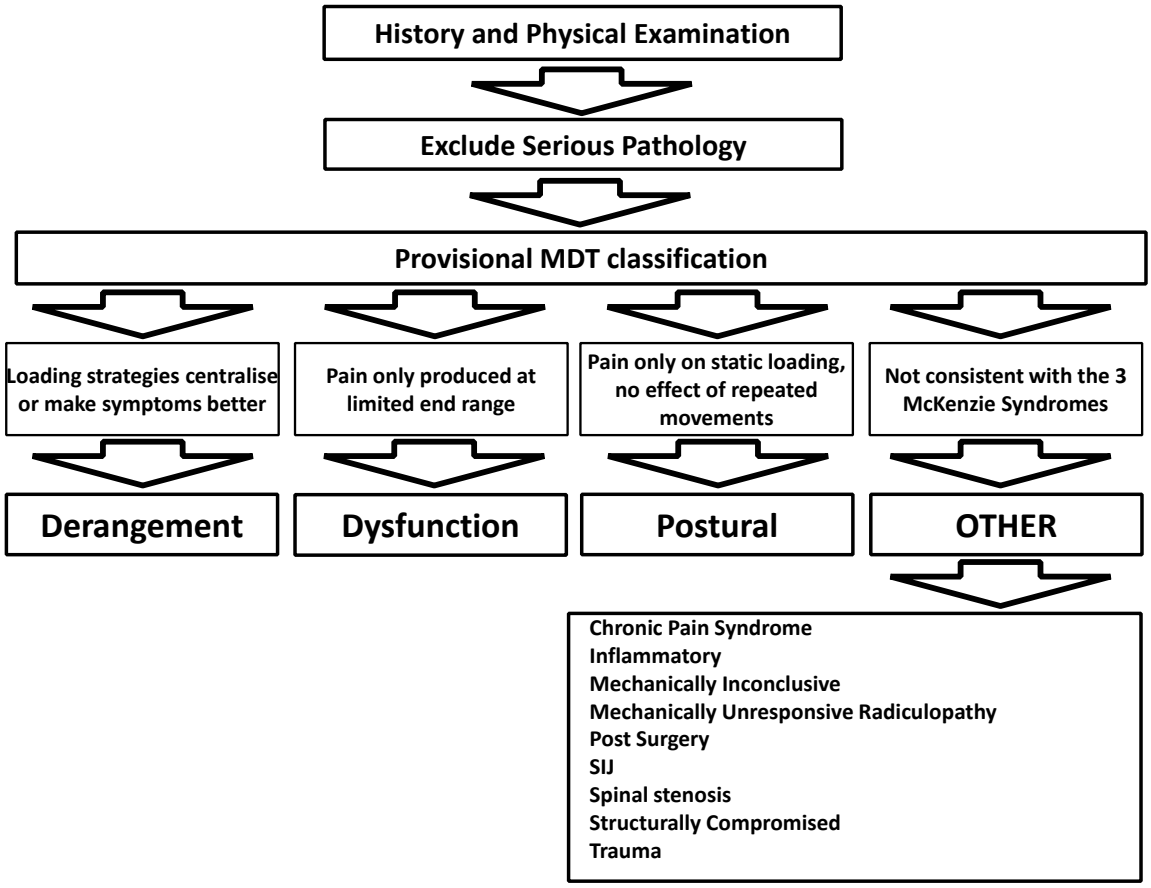
- Do not display the symptomatic or mechanical responses of Derangement, Dysfunction or Postural Syndromes
- No lasting favourable response
- Inconsistent responses
- Sub groups of OTHER may present with recognizable symptomatic and mechanical responses or non-recognizable patterns or response
- Definitions contained in Table of OTHER (see below)

# McKenzie Classification – Spinal OTHER

| Serious pathology (list is not exhaustive) | | |
|---|---|---|
| **Category** | **Clinical findings (Red Flags)** | **Clinical Examples** |
| Cancer | Age >55, **history of cancer**, unexplained weight loss, progressive, not relieved by rest | May be primary site or metastases |
| Cauda equina syndrome /cord compression | Bladder / bowel dysfunction, saddle anaesthesia, global or motor weakness in legs. Clumsiness in legs | |
| Spinal fracture | History of severe trauma, older age, prolonged steroid use OR young, active with sport related back pain | Compression fracture, stress fracture of the pars |
| Spinal related infection | Fever, malaise, constant pain, all movements worsen | Epidural abscess, discitis, transverse myelitis |
| Vascular | Vascular disease, smoking history, family history, age over 65, male>female<br>History of trauma, dizziness, diplopia, dysarthria and multiple other non-mechanical symptoms | Abdominal aortic aneurism, cervical artery dysfunction |

| Subgroup | Definition | Criteria (common) | Clinical examples |
|---|---|---|---|
| **Chronic Pain Syndrome** | Pain-generating mechanism influenced by psychosocial factors or neurophysiological changes | Persistent widespread pain, aggravation with all activity, disproportionate pain response to mechanical stimuli, inappropriate beliefs and attitudes about pain. | |
| **Inflammatory** | Inflammatory arthropathy | Constant pain, morning stiffness, excessive movements exacerbate symptoms | RA, sero-negative arthritis, ankylosing Spondylitis |
| **Mechanically Inconclusive** | Unknown musculoskeletal pathology | Derangement, Dysfunction, Postural and subgroups of OTHER excluded.<br>Symptoms affected by positions or movements BUT no recognisable pattern identified OR inconsistent symptomatic and mechanical responses on loading | |
| **Mechanically Unresponsive Radiculopathy** | Radicular presentation consistent with a currently unresponsive nerve root compromise | Symptoms presenting in a radicular pattern in the upper or lower extremity.<br>Accompanied by varying degrees of neurological signs and symptoms.<br>There is no centralisation and symptoms do not remain better as a result of any repeated movements, positions or loading strategies | |
| **Post-Surgery** | Presentation relates to recent surgery | Recent surgery and still in post-operative protocol period | |
| **Sacro-iliac (SIJ)/Pregnancy-Related Pelvic Girdle Pain (PGP)** | Pain-generating mechanism emanating from the SIJ or symphysis pubis | Three or more positive SIJ pain provocation tests having excluded the lumbar spine and hip | If related to pregnancy: PGP |
| **Spinal Stenosis** | Symptomatic degenerative restriction of spinal canal or foramina | Lumbar Spine: older population, history of leg symptoms relieved with flexion activities and exacerbated with extension, longstanding loss of extension. Cervical Spine: arm symptoms consistently produced with closing foramen, abolished or decreased with opening | Lumbar stenosis, cervical lateral foraminal stenosis |
| **Structurally Compromised** | Soft tissue and/or bony changes compromising joint integrity | Mechanical symptoms (ROM restricted, clunking, locking, catching).<br>May have sensation of instability<br>Long history of symptoms or history of trauma.<br>Irreversible with conservative care. | Painful structural scoliosis, painful osteoporosis, grade 3-4 spondylolisthesis, upper cervical structural instability – RA |
| **Trauma/ Recovering Trauma** | Recent trauma associated with onset of symptoms | Recent trauma associated with onset of constant symptoms / recent trauma associated with onset of symptoms, now improving and pain intermittent | Post whiplash |

## 6. Differentiate between the Derangement, Dysfunction, Postural and OTHER




***Classification confirmed within 3-5 visits***
*(reduction or remodelling process may continue for longer)*

## REFERENCES FOR MODULE THREE

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## NOTES FOR MODULE THREE

# MODULE THREE

## Quiz

**Complete the following chart:**

| | **DERANGEMENT SYNDROME** | **DYSFUNCTION SYNDROME** | **POSTURAL SYNDROME** |
|---|---|---|---|
| | | | |
| **Mechanical Loading Producing the Symptoms:** Static / Dynamic Mid / End Range | | | |
| **Pain Location:** Local / Referred / Radicular | | | |
| **Pain Constancy:** Constant / intermittent | | | |
| **Acute Deformity:** Yes / No | | | |
| **Movement Loss:** Loss / No Loss | | | |
| **Effects of Repeated Movements** Inc, Dec, P, A, NE B, W, NB, NW, NE Cent., Perip. | | | |

# MODULE THREE

## Quiz

**Answer the following questions:**

1. Which are the three acute deformities that may be seen in patients with the Derangement syndrome? Conceptually what causes these deformities?

2. What are the essential differences between the pain patterns of the Derangement, Dysfunction and Postural Syndromes?

3. What is the definition of the centralisation phenomenon? In which syndromes does it occur?

4. What is a lateral shift? Describe the position of the body of a patient with a right lateral shift considering shoulders, hips, and weight-bearing through the legs.

5. What is the difference between a contralateral and an ipsilateral shift? Which is seen more frequently?

6. Using the case study provided, discuss why the symptoms:

   - Could / could not be those of Postural Syndrome
   - Could / could not be those of Dysfunction Syndrome
   - Could / could not be those of Derangement Syndrome

# MODULE FOUR

## HISTORY AND PHYSICAL EXAMINATION

### Objectives

By participating fully in this module, a participant will be able to:

1. Discuss the aims of the history taking.

2. Describe the components of the history section of the McKenzie lumbar assessment form and discuss the clinical relevance of each section

3. Discuss the use of effective patient questioning strategies and the interpretation of the patient's responses to the history questions.

4. Discuss the aims of the physical examination.

5. Describe the components of the physical examination section of the McKenzie lumbar assessment form and discuss the clinical relevance of each section .

6. Define and demonstrate the appropriate use of terms involved in completing the McKenzie lumbar spine assessment form.

7. Accurately complete a McKenzie Lumbar assessment form.

# MODULE FOUR

## HISTORY AND PHYSICAL EXAMINATION

**1. Discuss the aims of history taking.**

- An overall impression of the clinical presentation
- Site of the back pain: central / symmetrical, or unilateral / asymmetrical; if unilateral is the pain in the back or thigh, or referred below the knee
- The stage of the disorder – acute / sub-acute / chronic
- The status of the condition – improving / unchanging / worsening
- Identification of 'red flags' or contraindications
- Baseline measurements of the symptomatic (and mechanical presentations) against which improvements can be judged
- Factors which aggravate and relieve the problem, and role of posture, which may help guide future management
- The severity of the problem which may guide the vigour of the physical examination
- The functional limitations that the condition has caused on the patient's quality of life
- An impression of any potential psychosocial issues that may impact the management and outcome. For example; the way the patient is responding to their condition, and how much encouragement, information, reassurance or convincing they may need to be active participants in their own management
- *A hypothetical diagnosis by syndrome*

**2. Describe the components of the history section of the McKenzie lumbar assessment form and discuss the clinical relevance of each section.**

- Patient
- Age
- Occupation / leisure activities
- Functional disability
- Symptoms
  - Symptoms this episode – Body chart
  - Duration
  - Status
  - Onset
  - Symptoms at onset
  - Constant or intermittent
  - What makes the pain worse / better?
    ⬭ Circle used to signify "always"
    Underline used to signify "sometimes"
    ⟍ Oblique line used to signify "no effect"
  - Diurnal pattern

- Previous history
  - Back pain / treatment
  - X-ray / imaging

- Specific questions
  - Tingling / numbness / weakness
  - Red flags

**Red Flag Clues**

- Age (>55)
- History of cancer
- Unexplained weight loss
- Constant, progressive, non-mechanical pain, worse at rest
- Systemically unwell
- Persisting severe restriction of lumbar flexion
- Widespread neurological deficit
- Prolonged steroid use
- History of intravenous drug use
- History of significant trauma enough to cause fracture or dislocation (X-rays will not always detect fractures)
- History of trivial trauma and severe pain in potential osteoporotic individual
- No movement or position centralises, decreases, or abolishes pain
- Bladder / Bowel dysfunction

**3. Discuss the use of effective patient questioning strategies and the interpretation of the patient's responses to the history questions.**

Active listening is an integral part of the communication process - that is to understand the underlying meaning behind the words used. Hearing is a passive act, whereas listening is an active process. The following techniques are recommended to maintain a patient-centred approach and effective communication. These may also facilitate a reduction in the patient's apprehension and fear and may assist in addressing psychosocial issues when present, promote understanding and encourage compliance

- Simple open-ended questions
- Active listening
- Being non-judgemental
- Adjusting vocabulary to individual patients
- Providing 'normative permission' (suggesting that the patient's situation or attitudes are common so they are comfortable discussing them)
- Encouragement with verbal and non-verbal prompts (non-verbal cues can convey 70-90% of your message)
- Clarifying and summarising – in order to bridge the gap between the patient's meaning and the practitioner's interpretation:
  - Paraphrasing to encapsulate what the patient has said
  - Ask further probing questions
  - Summarising to give an overview of the patient's comments

- Reflective thinking – reflecting and exploring emotional aspects of the patient's problem.
- Remaining unbiased

**4. Discuss the aims of the physical examination**

- Usual posture
- Symptomatic response to posture correction
- Any obvious deformities or asymmetries that are related to this episode
- Neurological examination
- Baseline measures of mechanical presentation
- Symptomatic and mechanical response to repeated movements
- Symptomatic response to static testing

**Conclusions:**
- Provisional classification
- Principle of management
- Appropriate loading strategy

**5. Describe the components of the Physical examination section of the McKenzie lumbar assessment form and discuss the clinical relevance of each section**

**Postural Observation**
- Sitting posture and its effect on pain
- Posture correction – better, worse, no effect
- Standing posture – poor, fair, good
- Lordosis – increased, decreased, normal
- Lateral shift – right, left, nil; Relevant yes / no

- Criteria for a relevant lateral shift
  - Upper body is visibly and unmistakably shifted to one side
  - Onset of shift occurred with back pain
  - Patient is unable to correct shift voluntarily
  - Or, if patient is able to correct shift they are unable to maintain correction
  - Correction affects intensity of symptoms
  - Correction causes centralisation or worsening of peripheral symptoms.

- Other Observations – e.g. structural scoliosis, kyphosis, leg length difference

**Neurological**

- Criteria for conducting a neurological examination
  - Paraesthesia in the leg
  - Weakness in the leg
  - Thigh or leg symptoms, especially in a radicular pattern
- Components:
  - Sensation
  - Muscle power
  - Reflexes
  - Nerve tension tests

- Movement loss
  - Range of movement
  - Pain or stiffness that stops the movement
  - Movement pathway – deviation
  - Confidence and willingness to move
  - Curve reversal

- Repeated movements
  Movements that can be performed (not all need to be)
  - Flexion in standing
  - Extension in standing
  - Flexion in lying
  - Extension in lying
  - Side gliding (as required)

- Monitor symptom / Mechanical response
  - Establish symptoms present <u>prior</u> to testing
  - Ask about pain response <u>during</u> the movement
    - Is it - During the movement (Pain During Movement) PDM
    - Or - At end range (End Range Pain) ERP
  - Establish symptoms <u>after</u> testing
  - Observe and record the mechanical response – increased, decreased, no effect

- Static tests
  - Sitting slouched
  - Long sitting
  - Sitting erect
  - Standing slouched
  - Standing erect
  - Lying prone in extension

- Other Tests – performed if symptoms are not influenced by the testing above
  - SIJ
  - Hip
  - Other peripheral structures

**Provisional Classification**

Derangements
Step 1: Circle word “Derangement”
Step 2: Circle “Appropriate symptom location”
Step 3: Indicate “Directional Preference”

Dysfunction
Step 1: Circle word “Dysfunction”
Step 2: Indicate direction

Postural
Step 1: Circle word “Postural”

OTHER
Step 1: Circle word “OTHER”
Step 2: Indicate sub-group

## 6. Define and demonstrate the appropriate use of terms involved in completing the McKenzie lumbar spine assessment form

**During Loading** - Either by repeated movements or sustained postures

- **Increase** (↑) Symptoms already present are increased in intensity.
- **Decrease** (↓) Symptoms already present are decreased in intensity.
- **Produce** (P) Movement or loading creates symptoms that were not present prior to the test.
- **Abolish** (A) Movement or loading abolishes symptoms that were present prior to the test.
- **Centralising** Movement or loading moves the most distal pain proximally.
- **Peripheralising** Movement or loading moves the pain more distally.
- **No Effect** (NE) Movement or loading has no effect on the symptoms during the testing.

**After Loading** - Either repeated movements or sustained postures

- **Worse** (W) Symptoms produced or increased with movement or loading remain aggravated following the test.
- **No Worse** (NW) Symptoms produced or increased with movement or loading return to baseline following the test.
- **Better** (B) Symptoms decreased or abolished with movement or loading remain improved after testing.

  Or

  Symptoms produced, decrease on repetition, remain better after testing.
- **No Better** (NB) Symptoms decreased or abolished with movement or loading return to baseline after testing.
- **Centralised** Distal pain abolished by movement or loading remain abolished after testing.
- **Peripheralised** Distal pain produced during movement or loading remain after testing.
- **No Effect** (NE) Movement or loading has no effect on symptoms after testing.

# NOTES FOR MODULE FOUR

# MODULE FOUR

## Quiz

**Answer the following questions:**

1. In the case study provided are there any Red Flag indicators?

2. What do we evaluate in the examination of "movement loss"? *(four factors)*

3. Describe what is meant by the terms:
   (a) Left lateral shift
   (b) Left sidegliding in standing
   (c) Deviation in flexion to the left

4. Which conditions may cause deviation in flexion?

5. Why does McKenzie use repeated movement testing?

6. When do we evaluate pain during repeated movement testing?

7. Complete the following chart:

| REPEATED MOVEMENT TESTING | DYSFUNCTION | DERANGEMENT |
|---|---|---|
| 1. PDM or ERP | | |
| 2. Effects during testing | | |
| 3. After-effect on the symptoms | | |

8. Using the case study provided record the findings of the examination on the McKenzie assessment form provided.

# MODULE FIVE

# ANATOMICAL CONSIDERATIONS RELATED TO MECHANICAL DIAGNOSIS AND THERAPY (MDT)

## Objectives

By participating fully in this module, a participant will be able to:

1. Describe the structure, function and biomechanics of the intervertebral disc.

2. Describe the key biomechanical features of the lumbar spine.

3. Describe and explain the clinical significance of disc diurnal variations, disc nutrition and changes in the disc with aging.

4. Describe the clinical significance of creep.

5. Describe and differentiate the stages of disc degeneration.

6. Relate stages of degeneration to clinical presentations.

# MODULE FIVE

## ANATOMICAL CONSIDERATIONS RELATED TO MECHANICAL DIAGNOSIS AND THERAPY (MDT)

Any structure that is innervated is a potential source of back pain. Proven sources of back pain are the intervertebral discs (IVD), zygapophyseal joints and sacroiliac joints. The focus in this section will be the IVD, which has been shown to be the commonest cause of back pain and the most relevant to MDT.

### 1. Describe the structure, function and biomechanics of intervertebral disc

- Concentric layers of annulus fibrosus
- Surrounding incompressible nucleus pulposus
- Nucleus acts to distribute pressure evenly
- Behaves hydrostatically
- Outer annulus is innervated, more deeply in degenerated discs.
- Postero–lateral annulus is weakest, less radius, not as firmly attached to vertebral end plate, no cover of the posterior longitudinal ligament.
- Anterior compression caused by flexion 'squeezes' the nucleus backwards, and conversely extension forces it forwards.
- Postures of the spine which result in decentralization of the nucleus pulposus due to asymmetrical loading of the intervertebral segment play an important role in the pathogenesis and in the prophylaxis of intervertebral disc diseases.

### 2. Describe the key biomechanical features of the lumbar spine.

- Flexion and extension involve two components – sagittal rotation and sagittal translation. For instance, in flexion there is a combination of anterior sagittal rotation and anterior translation of the lumbar vertebrae.
- Flexion: the intervertebral disc is compressed anteriorly and the posterior annulus is stretched. Flexion causes a posterior displacement of the nucleus pulposus. The movement causes a lengthening of the vertebral canal, and places tension on the spinal cord and the peripheral nervous system. Intradiscal pressure, measured in the nucleus pulposus, increases by up to 80% in full flexion.
- Extension the intervertebral disc is compressed posteriorly and the anterior annulus is stretched. The movement is associated with impacting of the spinous processes, or the inferior articular processes on the lamina below. Loading may be concentrated in the area of the pars interarticularis. Extension causes an anterior displacement of the nucleus pulposus. Extension reduces the size of the vertebral canal and intervertebral foramen. Nuclear pressure is reduced by up to 35% in extension.

See Objective 3.

**3.** Describe and explain the clinical significance of **disc diurnal variations, disc nutrition, and changes in the disc with ageing.**

**Diurnal variations**

- Osmotic pressure from proteoglycans causes water absorption when unloaded in the night
- Loading during the day forces water out of the disc
- Results in 10% loss in disc height
- 1-2% change in height during day
- 300% stiffer to flexion forces in early morning compared to later in the day
- Range of movement increases during the day

**Disc nutrition**

- Adult disc is avascular
- Metabolites are transferred via
  - Blood vessels surrounding the annulus, from periphery of disc
  - Blood supply beneath the hyaline cartilage, from vertebrae above and below.
- Mechanism of transferral of metabolites is via diffusion, by fluid flow
- Greater fluid loss in flexion than in extension
- Flexion facilitates loss by compression.
- Influx of fluid into disc when lying
- There is an outflow when standing, sitting, and carrying a load.
- Disc nutrition is increased by the fluid exchange that accompanies reciprocal movements in the sagittal plane.

**Structural changes within the disc**

- Transverse tears or rim lesions, with rupture of Sharpey's fibres in the periphery of the annulus near the ring apophysis, or in the outer wall of the annulus
- Circumferential tears, between the lamellae of the annulus
- Radial fissures, occurring across the layers of the annulus
- Desiccation and break-up of nucleus

**4. Describe the Clinical significance of Creep**

**Time factor and creep loading**

- Sustained loading / time can be a factor in spinal pain
- Insidious onset is more common than trauma
- Experimentally shown that loading history / accumulative stress can have pathological consequences
- Biomechanical explanation is in collagen behaviour to sustained loading:
  - Creep – continued displacement of collagen fibres with sustained load
  - Hysteresis – restoration of 'normal' shape with unloading
  - Hysteresis occurs more slowly than creep
  - Set – difference between initial shape and effect of creep

*'The clinical importance of fatigue failure is that damage to tissues may occur without a history of major or obvious trauma.'* (Bogduk 1997)

Hence, this may explain why the onset of musculoskeletal problems in many cases appears to be for 'no apparent reason'.

## 5. Describe and differentiate the stages of disc degeneration

- Internal disc disruption
- Radial fissures in annulus
- Desiccation of nucleus
- The intervertebral disc becomes vulnerable when tears and attritional changes cause the annulus fibrosus to lose its elasticity and allow the central gel-like tissue of the nucleus pulposus to be displaced beyond its physiological limits. (Kramer 1990)
- Internal Intra-discal mass displacement of disc material can occur with loading
- If the internal architecture of the disc is intact displacement is reversed on returning to a symmetrical posture.

The symptoms caused by a disc protrusion vary because the protruding disc tissue is still part of an intact osmotic system and participates in the pressure-dependent changes of volume and consistency of the disc. As long as the protruding tissue is covered by strong intact lamellae of the annulus fibrosus, the displaced fragment can relocate back into the centre of the disc. In some cases the protruded tissue can displace further and rupture the annulus fibrosus as a disc extrusion. If the outer annular wall is weakened or ruptured disc herniation may result.

## 6. Relate stages of degeneration related to clinical presentations

### Discogenic pain

- Internal disc disruption, with intact outer annular walls without nerve root involvement, can be the cause of back and leg pain.
- Site of the referred pain depended on the site where the annulus is being stimulated.
- Correlation between fissures penetrating to outer annulus and pain is very high

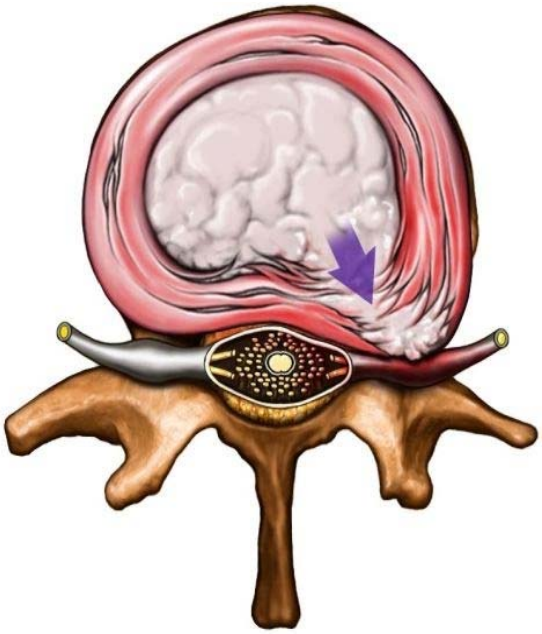
### Disc herniation

### Disc herniations: terms and pathology

There has been a lack of standardisation of terminology used to describe disc herniations, and synonyms are many and varied. In this context the following definitions will be used:

| TERM | PATHOLOGY |
|---|---|
| Displacement | Intra-discal mass displacement within annulus |
| Herniation | Non-specific term including any of below |
| Protrusion | Intact and competent annular wall |
| Protrusion | Intact annular wall, but so attenuated as to be incompetent |
| Extrusion | Annular wall breached by intra-discal mass that protrudes through, but remains in contact with disc |
| Sequestration | Annular wall breached by intra-discal mass that has separated from disc |

**Disc Extrusion**



**Typical features of disc pathology (commonly extrusion or sequestration) resulting in nerve root involvement**

- Unilateral leg pain in a typical root distribution below the knee
- Specific neurological symptoms incriminating a single nerve
- Limitation of straight leg raising by at least 50% of normal, with reproduction of leg pain
- Positive crossed straight leg raise
- Segmental motor deficit
- Segmental sensory change
- Hyporeflexia
- Kyphotic and/or scoliotic deformity
- Imaging evidence of a disc pathology at the relevant level.

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3. Stefanakis M, Key S, Adams MA. Healing of painful intervertebral discs: implications for physiotherapy. Part 1: the basic science of intervertebral discs healing. Phys Ther Rev 2012;17:234-240.

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5. Wetzel FT, Donelson R. The role of repeated end-range / pain response assessment in the management of symptomatic lumbar discs. Spine J 2003;3:146-15.

## NOTES FOR MODULE FIVE

# MODULE FIVE

## Quiz

**Answer the following questions:**

1. What are the basic functions of nucleus and annulus?

2. What is the weakest part of the annulus? Give some reasons why.

3. What stresses are most injurious to the annulus?

4. Summarise the mechanical effect of flexion and extension

| | **IV disc compressed anteriorly or posteriorly** | **Displacement of nucleus posteriorly or anteriorly** | **Nuclear pressure increased or decreased** | **Spinal cord & nerve roots stretched or relaxed** |
|---|---|---|---|---|
| Flexion | | | | |
| Extension | | | | |

5. What is the clinical significance of diurnal variations in the IV disc?

6. Describe the stages of disc degeneration.

7. Using the case study provided discuss which stage of disc degeneration is most likely to be responsible for the presenting symptoms – give reasons.

# MODULE SIX

## EVALUATION OF CLINICAL PRESENTATIONS

### Objectives

By participating fully in this module, a participant will be able to:

1. Discuss the symptomatic and mechanical presentations obtained during the assessment.

2. Describe the symptomatic and mechanical presentations of Derangement, Dysfunction, and Postural Syndrome patients.

3. Discuss the symptomatic and mechanical presentations of the subgroups of OTHER.

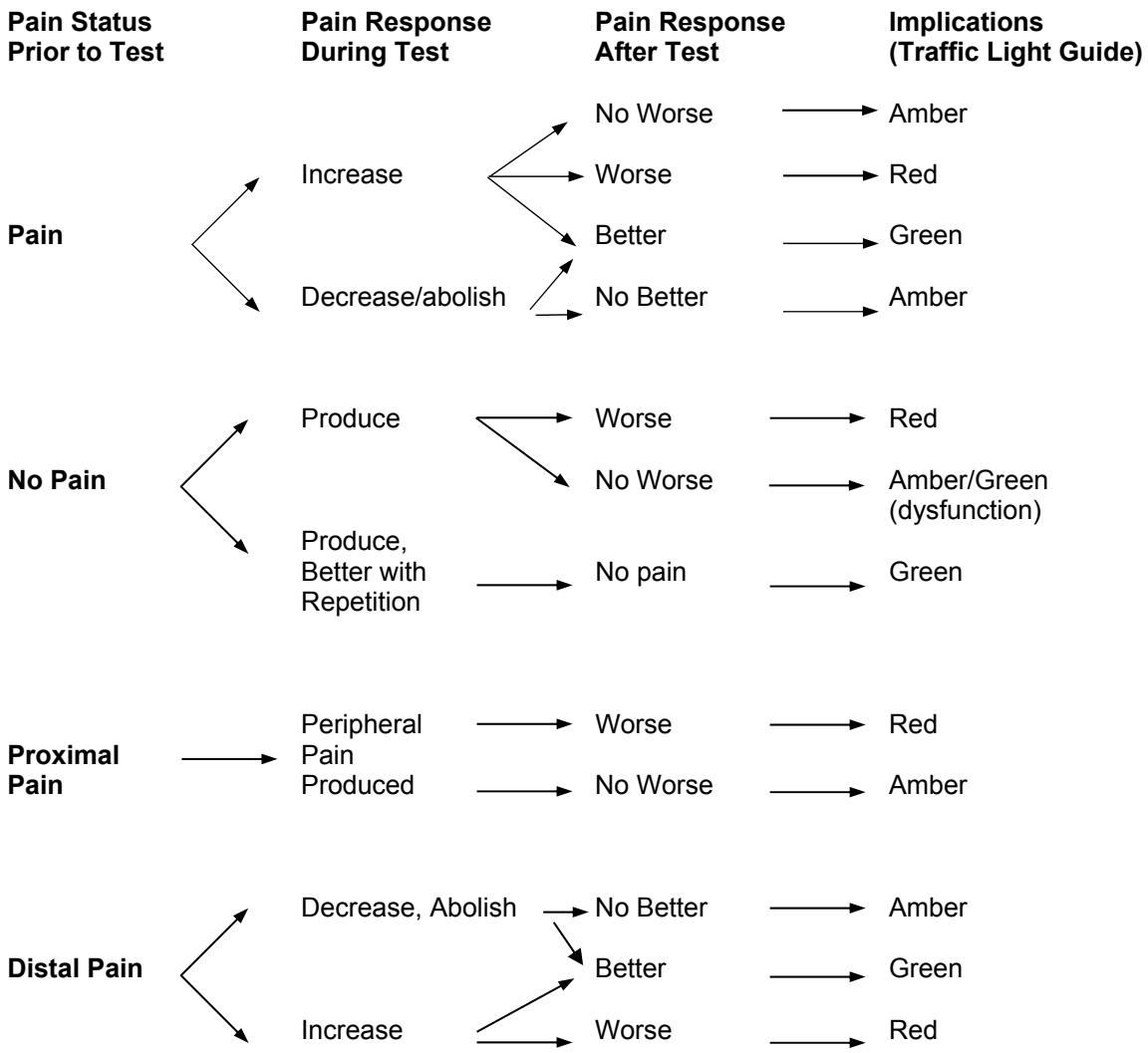
4. Discuss the management principles of the three McKenzie syndromes.

# MODULE SIX

## EVALUATION OF CLINICAL PRESENTATIONS

**1. Discuss the symptomatic and mechanical presentations obtained during the assessment.**

### TRAFFIC LIGHT GUIDE TO SYMPTOM RESPONSE



**MECHANICAL RESPONSES TO LOADING STRATEGY**

| Range of Movement Change | | After | | Implications |
|---|---|---|---|---|
| Increase | → | Better | → | Green |
| Decrease | → | Worse | → | Red |
| No Change | → | | | Amber |

**2. Describe the symptomatic and mechanical presentations of Derangement, Dysfunction and Postural Syndrome patients.**

**Repeated movements in Derangement Syndrome**

- Repeated movements in the direction that produces greater deformation of spinal structures will produce, worsen the symptoms and peripheralise the pain
- And cause an obstruction to movement
- Movements in the opposite direction will reduce deformation of those structures
- Cause abolition, reduction of symptoms and cause centralisation of pain
- And cause an increase in range of movement

Thus repeated movements are diagnostic of the Derangement Syndrome as well as confirming the Directional Preference of the management strategy, to which clues will have been provided in the history.

Once a repeated movement has been found that makes the symptoms better or centralises symptoms, and/or improves the mechanical presentation, no further testing is necessary and that movement is used in the management strategy.

Often this response is apparent on day one, sometimes further testing over up to three visits is necessary to confirm the classification.

**Repeated movements in Dysfunction Syndrome**

- Repeated movements in the direction that puts tension on adaptively shortened structures will produce end-range pain on every occasion
- Alternatively, repeated compression of structurally impaired tissue could consistently reproduce the patient's symptoms at end-range
- Repeated movements will not make the patient progressively worse
- When they return to the neutral position the pain will abate
- Pain will not be peripheralised
- The only time distal symptoms will be produced is with an Adherent Nerve root

Thus repeated movements are diagnostic of Dysfunction Syndrome, and also reveal the movement that requires repetition to remodel adaptively shortened tissues.

**Repeated movements in Postural Syndrome**

- No pain on any test movements or their repetition
- No loss of normal range of movement
- Pain only on sustained posture

Thus repeated movements will have no effect in Postural Syndrome.

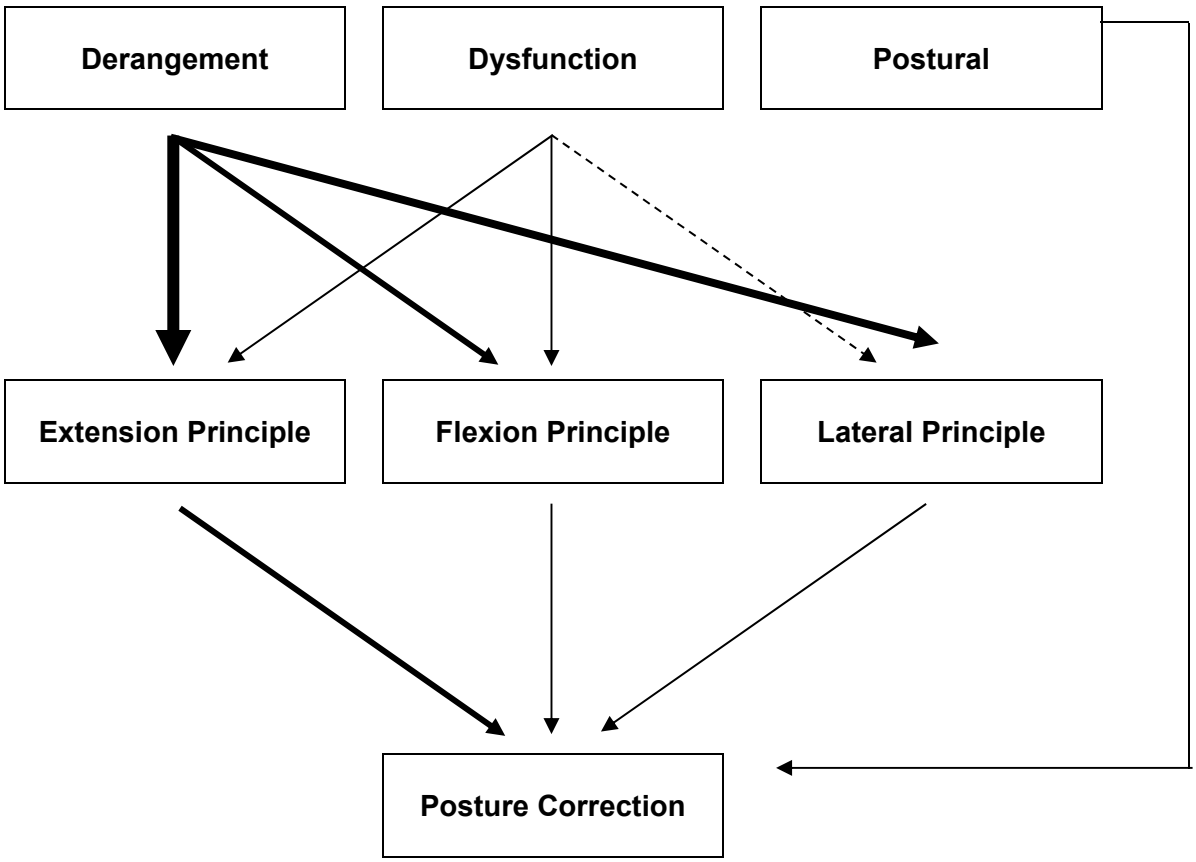
**3 Discuss the symptomatic and mechanical presentations of the subgroups of OTHER.**

**Repeated movements in other categories**

- None of the above symptomatic or mechanical responses are identified
- No lasting favourable response
- Inconsistent responses
- Sub groups of OTHER may present with recognizable symptomatic and mechanical responses or non-recognizable patterns or response
- Refer to Table Spinal of OTHER Module Three

**4. Discuss the management principles of the three syndromes.**

**PRINCIPLES OF MANAGEMENT IN MECHANICAL THERAPY**



# NOTES FOR MODULE SIX

# MODULE SIX

## Quiz

**Complete the Worse / Better sections for:**

**CASE STUDY**

| | | | | | |
|---|---|---|---|---|---|
| **Worse:** | Bending | Sitting/Rising | Standing | Walking | Lying |
| | AM | As the day progresses | PM | When still | On the move |
| | Other: | _____ | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Better:** | Bending | Sitting | Standing | Walking | Lying |
| | AM | As the day progresses | PM | When still | On the move |
| | Other: | _____ | | | |

**ANTERIOR DERANGEMENT**

| | | | | | |
|---|---|---|---|---|---|
| **Worse:** | Bending | Sitting/Rising | Standing | Walking | Lying |
| | AM | As the day progresses | PM | When still | On the move |
| | Other: | _____ | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Better:** | Bending | Sitting | Standing | Walking | Lying |
| | AM | As the day progresses | PM | When still | On the move |
| | Other: | _____ | | | |

**ADHERENT NERVE ROOT**

| | | | | | |
|---|---|---|---|---|---|
| **Worse:** | Bending | Sitting/Rising | Standing | Walking | Lying |
| | AM | As the day progresses | PM | When still | On the move |
| | Other: | _____ | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Better:** | Bending | Sitting | Standing | Walking | Lying |
| | AM | As the day progresses | PM | When still | On the move |
| | Other: | _____ | | | |

**POSTURAL SYNDROME**

| | | | | | |
|---|---|---|---|---|---|
| **Worse:** | Bending | Sitting/Rising | Standing | Walking | Lying |
| | AM | As the day progresses | PM | When still | On the move |
| | Other: | _____ | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Better:** | Bending | Sitting | Standing | Walking | Lying |
| | AM | As the day progresses | PM | When still | On the move |
| | Other: | _____ | | | |

# MODULE SIX

## Quiz

### RECORDING THE EFFECT OF REPEATED MOVEMENT TESTING

**Listed are the seven key words used to describe symptom behaviour *during* testing. Indicate which words may be used for each Syndrome**

| KEY WORD | POSTURAL SYNDROME | DYSFUNCTION SYNDROME | DERANGEMENT SYNDROME |
|---|---|---|---|
| **Produces** | | | |
| **Increases** | | | |
| **Decreases** | | | |
| **Abolishes** | | | |
| **Centralising** | | | |
| **Peripheralising** | | | |
| **No Effect** | | | |

**Listed are the five terms to describe symptom behaviour *after* testing: Indicate which words may be used for each Syndrome**

| KEY WORD | POSTURAL SYNDROME | DYSFUNCTION SYNDROME | DERANGEMENT SYNDROME |
|---|---|---|---|
| **Better** | | | |
| **No Better** | | | |
| **Worse** | | | |
| **No Worse** | | | |
| **No Effect** | | | |
| **Centralised** | | | |
| **Peripheralised** | | | |

**Complete the following table: Record the expected response <u>During</u> and <u>After</u>**

| MECHANICAL SYNDROME | EFFECTS OF REPEATED FLEXION | EFFECTS OF REPEATED EXTENSION |
|---|---|---|
| **Posterior Derangement** | | |
| **Anterior Derangement** | | |
| **Flexion Dysfunction** | | |
| **Adherent Nerve Root** | | |
| **Extension Dysfunction** | | |
| **Postural Syndrome** | | |

## RECOGNITION OF CLINICAL PRESENTATIONS USING REPEATED MOVEMENTS

From the following repeated movement information identify the most likely syndrome.

**Patient One:**

Pre-test pain in standing – central low back pain

| | | |
|---|---|---|
| FIS | Increases | |
| R FIS | Increases | W |
| EIS | NE | |
| R EIS | Decreases | B |

Pre-test pain in lying - central low back pain

| | | |
|---|---|---|
| FIL | Increases | |
| R FIL | Increases | W |
| EIL | Decreases | |
| R EIL | Decreases | B |

**Patient Two:**

Pre-test pain in standing - Ache to right of L4/5 and right buttock pain

| | | |
|---|---|---|
| FIS | Increases | |
| R FIS | Increases | W |
| EIS | Increases | |
| R EIS | Increases | W |
| RtSGIS | Increases | |
| R RtSGIS | Centralising to low back | B |
| LSGIS | Increases | |
| R LSGIS | Peripheralising to right thigh | W |

**Patient Three:**

Pre-test pain in standing - Nil

| | |
|---|---|
| FIS | NE |
| RFIS | NE |
| EIS | NE |
| REIS | NE |

Pre-test pain in lying - Nil

| | |
|---|---|
| FIL | NE |
| RFIL | NE |
| EIL | NE |
| REIL | NE |

**Patient Four:**

Pre-test pain in standing - Nil

| | | |
|---|---|---|
| FIS | NE | |
| RFIS | NE | |
| EIS | Produces pain lumbar spine at ER | |
| REIS | Produces pain lumbar spine at ER | NW |

Pre-test pain in lying – Nil

| | | |
|---|---|---|
| FIL | NE | |
| RFIL | NE | |
| EIL | Produces pain lumbar spine at ER | |
| REIL | Produces pain lumbar spine at ER | NW |

**Patient Five:**

Pre-test pain in standing – Nil

| | | |
|---|---|---|
| FIS | Produces right calf pain at ER | |
| RFIS | Produces right calf pain at ER | NW |
| EIS | NE | |
| REIS | NE | |

Pre-test pain in lying - Nil

| | | |
|---|---|---|
| FIL | NE | |
| RFIL | NE | |
| EIL | NE | |
| REIL | NE | |

**Patient Six:**

Pre-test pain in standing – Central LBP

| | | |
|---|---|---|
| FIS | Increases during movement | |
| RFIS | Decreases | B |
| EIS | NE | |
| REIS | Increases | W |

Pre-test pain in lying – Central LBP

| | | |
|---|---|---|
| FIL | Increases | |
| RFIL | Abolishes | B |
| EIL | NE | |
| REIL | Produces | W |

# MODULE SEVEN

## PROCEDURES OF MECHANICAL THERAPY

### Objectives

By participating fully in this module, a participant will be able to:

1. Describe and explain the use of the “force progressions” concept in the McKenzie method.

2. Describe and explain the use of the “force alternatives” concept in the McKenzie method.

3. Discuss the differences between patient procedures and clinician procedures.

4. Describe and evaluate the results of patient procedures and clinician procedures in the management of the three McKenzie syndromes.

# MODULE SEVEN

## PROCEDURES OF MECHANICAL THERAPY

**1. Describe and explain the use of the "force progressions" concept in the McKenzie method.**

The use of *"progression of forces*" has several advantages

- The patient can regularly apply the procedures throughout the day, with far more frequency than would be possible if the patient was only treated in the clinic.
- They are able to become independent of the therapist, and are given the opportunity to manage the problem themselves should it recur in the future.
- Furthermore, should it be necessary to progress forces as far as manipulative therapy, the hundreds of repeated movements that will have preceded this intervention provides a built in safe-guard; the integrity of the structure will have been fully tested and any likelihood of exacerbating fragile pathology will have been exposed.
- Force progression is considered when the previously employed technique increases or decreases symptoms during the procedure, but afterwards they are no worse or no better.
- If a procedure results in the centralisation of symptoms or symptoms remain better it does not need to be progressed or supplemented in any way, provided there is a continued increase of movement to end-range.
- If a procedure results in the worsening or peripheralisation of symptoms it should be stopped and force alternatives be considered. Only when symptoms remain unchanged following a procedure should force progressions be considered.
- Force progression could also include increasing the number and frequency of exercises and prolonging the period over which exercises are tested out. For instance, a twenty-four hour test period may provide a more definite response than one gained during a short clinic visit. Some flexibility in the application of force progressions and force alternatives may be required.
- Application of force progressions and force alternatives should always be conducted with due consideration given to clinical reasoning and attentive interpretation of symptomatic and mechanical responses.

**Possible Force Progressions**

- Dynamic patient generated forces
  - Patient motion to mid-range
  - Patient motion to end-range
  - Patient motion to end-range with patient overpressure

- Clinician generated forces
  - Patient motion to mid-range with clinician overpressure
  - Patient motion to end-range with clinician overpressure
  - Clinician mobilisation
  - Clinician manipulation

**2. Describe and explain the use of the "force alternatives" concept in the McKenzie method.**

- At times, rather than a force progression, a force alternative may be needed. For instance, the response to extension in standing may be equivocal, or even cause a worsening of symptoms, however in the same individual, extension performed in lying may make the symptoms better.
- If at any point during exploration of sagittal plane movements these are all found to worsen symptoms, then lateral forces need to be considered.
- Sustained positions progression of forces
  - Positioning in mid-range
  - Positioning at end-range

  These are commonly used in patients with an acute kyphotic deformity, any attempt to force extension will result in a severe exacerbation of their problem. A gradual recovery of extension over time is the appropriate management.

**Force alternatives**

- Starting position, example: loaded or unloaded
- Direction of loading strategy, example: sagittal or frontal plane movements, or a combination
- Sagittal direction: flexion or extension
- Time factor, example: sustained positioning or repeated movements
- Frontal plane angle during combined procedures, example: degree to which hips are shifted during EIL with hips off centre, or hip flexion angle during rotation mobilisation in flexion

**3. Discuss the differences between patient procedures and clinician procedures.**

- Patient techniques are used first, and will frequently be effective in resolving the problem without the need for more interventions.
- Provided there is adequate instruction and careful explanation regarding management of the problem, the self-treatment concept can be successfully applied to most back pain patients.
- Patients with Postural Syndrome can only resolve their problem with self-management strategies. Clinician interventions will be ineffective without the patient being educated regarding the role of posture as a cause of their pain.
- In the Dysfunction Syndrome, only the patient is able to provide the appropriate loading strategies with sufficient regularity to enable a remodelling of the structural impairment. Clinician procedures may aid this process, but are generally inadequate by themselves to resolve the tissue abnormality.
- In the Derangement Syndrome the majority of patients can successfully manage their own problem, whilst about 30% of patients will not recover with exercises alone and will need clinician techniques in addition.

- Patient techniques are only supplemented by clinician procedures when this becomes necessary because of a failure to improve. Whilst the patient is improving with self-management strategies there is absolutely no need to supplement treatment with additional interventions that encourage patient dependency.
- In certain instances, most notably the acute lateral shift deformity, clinician techniques may be needed to initiate the reductive process before the patient can begin to manage themselves.

**Procedures**

The procedures will be listed in three groups depending on the primary treatment principle with which they are associated. The major treatment principle is that involving extension; forces listed under flexion and lateral are used less frequently. Many of the procedures listed under extension and flexion principles involve purely sagittal plane forces. However certain procedures use a combination of sagittal and lateral plane forces, and these are also listed under extension and flexion.

**Table of treatment principles**

- Extension principle forces (procedures 1-10)
- Extension principle with lateral component (procedures11-15)
- Lateral principle forces (procedures 16-17).
- Flexion principle forces (procedures 18-21)
- Flexion principle with lateral component (procedures 22-25)

**Table of Procedures** (not all in order of force progression)

- Extension principle – static
    1. Lying prone
    2. Lying prone in extension
    3. Sustained extension
    4. Posture correction

- Extension principle
    5. Extension in lying (with patient overpressure) – EIL
    6a. Extension in lying with clinician overpressure
    6b. Extension in lying with belt fixation
    7. Extension mobilisation (in neutral or in extension)
    8. Extension manipulation
    9. Extension in standing – EIS
    10. Slouch-overcorrect

- Extension principle with lateral component
    11. Extension in lying with hips off centre
    12. Extension in lying with hips off centre with clinician overpressure (a: sagittal; b: lateral)
    13. Extension mobilisation with hips off centre
    14. Rotation mobilisation in extension
    15. Rotation manipulation in extension

- Lateral principle
    16. Self-correction of lateral shift or side gliding
    17. Manual correction of lateral shift

- Flexion principle
    18. Flexion in lying – FIL
    19. Flexion in sitting
    20. Flexion in standing – FIS
    21. Flexion in lying with clinician overpressure

- Flexion principle with lateral component
    22. Flexion in step standing – FISS
    23. Rotation in flexion
    24. Rotation mobilisation in flexion
    25. Rotation manipulation in flexion

**4. Describe and evaluate the results of patient procedures and clinician procedures in the management of the three McKenzie syndromes.**

- Most techniques, though not all, are done as repeated movements. The optimum number of movements is about ten to fifteen repetitions in one ‘set’. In certain instances several ‘sets’ of exercises may be done in succession.
- The number of times in a day that the series of exercises should be done will vary according to the mechanical syndrome, the severity of the problem, and the capabilities of the patient. In most instances a minimum of four or five sets a day is necessary to produce a change.
- Exercises or mobilisations will generally be performed in a rhythmical pattern – the procedure should be followed by a brief moment of relaxation. With each subsequent movement the range or pressure exerted should be increased, as long as the symptomatic response is favourable.
- In assessing the patient’s response to any technique, the symptomatic and mechanical presentation must be considered. In terms of the symptomatic response, the site, the severity, and the frequency of the pain may alter. In terms of the mechanical presentation, the range of movement and the functional level may alter.

# NOTES FOR MODULE SEVEN

# MODULE SEVEN

## Quiz

1. Discuss the inherent safety features of the progression of forces used in the McKenzie method.

2. Describe possible force alternatives and explain what clinical indicators would guide you to use a force alternative rather than a force progression.

3. For each of the three McKenzie syndromes discuss the role of patient procedures and clinician procedures.

4. From the case study provided discuss what force alternatives / progressions are used in evaluating and treating the patient.

# MODULE EIGHT

## MDT PROCEDURES - PRACTICAL

### OBJECTIVES

By participating fully in this module, a participant will be able to:

1. Perform and teach the MDT patient procedures for the lumbar spine.

2. Perform the MDT clinician procedures for the lumbar spine as described

3. Understand the rationale for the application of each procedure, and its place in the sequence of Progression of Forces.

# MODULE EIGHT

## MDT PROCEDURES - PRACTICAL

### EXTENSION PRINCIPLE - STATIC

#### PROCEDURE 1 – PRONE LYING

**Patient position**

- The patient lies in prone with their head turned to one side.
- The patient relaxes in this position, allowing the low back to sag into extension.
- The position is sustained for up to three minutes.

*Procedure 1 - Prone lying*

**Application**

- Basic requirement for the self-treatment of a Derangement responding to the extension principle is that the patient can attain and maintain the prone lying position.
- Care should be taken to maintain the lordosis when moving into the upright posture.
- With an acute lumbar kyphosis, one or two pillows can be placed under the abdomen as required, accommodating the deformity. After a time the pillows can be cautiously removed, so that a prone position is gradually attained.
- If improvements are not maintained, or prone lying is not achieved on the first occasion the patient must be instructed to lie over pillows on the floor or bed at home, and gradually lower themselves into the prone position by removing the pillows one at a time.

## PROCEDURE 2 – PRONE LYING IN EXTENSION

### Patient position

- The patient lies prone, and places the elbows under the shoulders to raise the top half of the body, using elbow and forearm support while the hips or pelvis remain on the bed.
- The patient relaxes in this position, allowing the low back to sag into more extension.
- The position is sustained for up to three minutes, and can be interrupted by a return to prone lying at regular intervals.

*Procedure 2 - Prone lying in extension*

### Application

- This procedure is a progression of procedure one and enhances its effect by increasing extension and by being sustained.
- In some Derangements the time factor is important and the position can be sustained for five minutes or more.
- If the patient finds it difficult to tolerate the position a return to prone lying is indicated at regular intervals.
- The procedure may also be useful in elderly patients who physically find it difficult to perform repeated extension in lying.

## PROCEDURE 3 – SUSTAINED EXTENSION

To apply a gradual and sustained extension stress to the lumbar spine it is necessary to have an adjustable treatment table, one end of which may be raised.

**Patient position**

- The patient lies prone and their upper body is gradually positioned into extension by the clinician raising the head of the table.
- Each position is held for up to a few minutes, according to the patient's tolerance
- The clinician then gradually returns the patient to the starting position.

*Procedure 3 – Sustained extension*

**Application**

- This is more likely needed with patients who have a kyphotic deformity
- This procedure is only used in the reduction of Derangements with major extension movement loss. Indeed, the suitable patient will normally be stuck in flexion and be unable to extend at all.
- In some patients a gradual and sustained extension force has a better symptomatic and mechanical response than an intermittent force, as with repeated extension in lying.
- With each progressive increase in extension range an initial increase in pain can be expected, however, this is followed by centralisation or symptoms remaining better.
- Once the maximum degree of extension is achieved this position is held for a few minutes, according to the patient's tolerance.
- When returning the patient to the starting position this also should be done gradually, over two or three minutes, otherwise the patient may experience severe back pain.
- Where possible, full range extension should be re-gained on the first treatment session, after which the patient should able to perform prone lying, prone lying in extension, and extension in lying (procedures 1, 2, 5), and continue with these procedures at home.
- However, if improvements are not maintained, or complete recovery is not achieved on the first occasion patients must be instructed to lie on the floor or bed at home with a pillow under their chest and gradually increase the pillows as able. Following the sustained position the pillows must be removed slowly, one at a time.

***Note:***
Sustained extension can also be used as a provocative test if a Derangement that responds to the flexion principle is suspected, but unclear. With the end of the plinth raised the patient is placed in sustained extension for up to five minutes. Their symptomatic and mechanical response is then evaluated. If pain remains worse following this procedure when the patient is upright again, a Derangement that responds to the flexion principle is suspected. This can be further tested by reviewing the mechanical response to flexion in standing, if the result of sustained extension is the production of a major loss of flexion and subsequently this is reversed by the flexion principle then classification is confirmed.

## PROCEDURE 4 – POSTURE CORRECTION

### Patient position

- The patient is guided from a kyphotic sitting position to an upright sitting posture by anteriorly rotating the pelvis, accentuating the lordosis and lifting the chest.
- The patient is then shown how to maintain this position using a lumbar roll.

*Procedure 4 – Posture Correction*

### Application

- Posture correction is the main intervention for pain in Postural Syndrome when the aggravating factor is sitting.
- Posture correction is also very important in management of Derangement.
- Posture correction and slouch overcorrect (procedure 10) may also useful procedures in patients with a Mechanically Inconclusive presentation.

# EXTENSION PRINCIPLE – DYNAMIC

## PROCEDURE 5 – EXTENSION IN LYING (EIL)

**Patient position**

- The patient starts in the prone lying position, with hands palm down under the shoulders.
- The patient raises the top half of the body by straightening their arms, while the pelvis and thighs remain relaxed.
- The position is maintained for one to two seconds, and then the patient returns to the neutral position.
- The patient repeats the movement in a rhythmical manner aiming to move further towards end range with each repetition.
- The movement should be repeated up to ten times.

*Procedure 5 –Extension in lying*

**(Extension in lying with patient overpressure)**

After the patient has performed extension in lying a number of times, and the procedure is well tolerated, full range of extension should be performed in the following way.

- The patient starts in the prone lying position, with hands palm down under the shoulders. The patient raises the top half of the body by straightening their arms, while the pelvis and thighs remain relaxed.
- When end range is achieved, the patient locks the elbows straight and breathes out, allowing the pelvis to sag. The position is maintained for one to two seconds, and then the patient returns to the neutral position.
- The patient repeats the movement in a rhythmical manner aiming to move into end range with each repetition.
- The movement should be repeated up to ten times.

**Application**

- This procedure is a further progression from procedures 1 and 2. Rather than a sustained extension force, an intermittent extension force is being applied, with greater amplitude.
- This procedure is the most important and effective exercise in the treatment of Derangements responding to the extension principle and extension Dysfunctions. Almost the maximum possible extension without external assistance is achieved with this manoeuvre.

- Following the exercise, care should be taken in resuming the upright posture. Every effort should be made to maintain the restored lordosis whilst moving from lying to standing.
- Extension in lying with patient overpressure should be routinely performed as early as possible, often on day one, to ensure end-range extension is being achieved. The patient is encouraged 'to sag the last two or three in each set of ten'.

## PROCEDURE 6A – EXTENSION IN LYING WITH CLINICIAN OVERPRESSURE

**Patient Position**

- The patient starts in the prone lying position, with hands palm down under the shoulders, close to the side of the treatment table where the clinician is standing.
- The table is at a height that allows the clinician to apply a perpendicular force to the spine.

**Clinician Position**

- The clinician crosses their arms, and places the heel of their hypothenar eminences on the transverse processes of the lumbar spine.
- The hands are at 90 degrees to each other and the hands are on the same spinal segment.
- The clinician's chest is over their hands so the line of force is perpendicular to the movement.
- No force is applied while positioning the hands.

*Procedure 6A –Extension in lying with clinician overpressure*

**Force applied**

- Gentle pressure is then applied through the arms using the body weight.
- Symmetrical pressure is applied, and the pressure is maintained, while the patient performs repeated extension in lying.
- The clinician moves with the patient in order to maintain a perpendicular force.
- Pressure is maintained throughout the movement and released when the patient returns to the starting position.
- The patient repeats the movement in a rhythmical manner aiming to move further towards end range with each repetition.
- The movement should be repeated up to ten times.

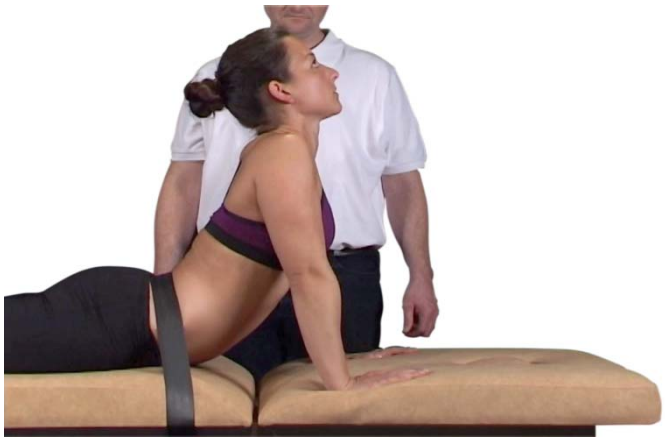
**Application**

- This procedure produces a greater and more localised passive extension stress than all previous procedures.
- The level can be changed depending on the response of the symptoms.
- The pressure should be appropriate to match the patient force.
- This is used for two purposes. It is diagnostic: If more pressure produces less pain during, a Derangement with an extension Directional Preference is confirmed. However, more pressure causing more pain DURING the procedure can also occur in the presence of a Derangement with an extension Directional Preference, as long as AFTER the procedure the symptoms are better or centralised. When the pressure is applied at the wrong segmental level or at the wrong angle a better or centralised response may not occur, then the adjacent levels above and below and variations in the lateral angle should be explored.
- In the case of Derangement, if symptoms are worse or peripheralised, force alternatives must be considered.
- In the case of Dysfunction, more pressure will produce more pain DURING the procedure (compared to no application of overpressure) and the symptoms will remain no worse once the procedure is finished.

## PROCEDURE 6B – EXTENSION IN LYING WITH BELT FIXATION

An alternative method of achieving overpressure is provided by a fixation belt, which can be applied around the treatment table and over the lumbar spine or pelvis. This prevents the pelvis from moving and accentuates the extension force at the lumbar spine.

*Procedure 6B – Extension in lying with belt fixation*



**Application**

- A belt can be lent to the patient if they have something it can be attached around at home, or a family member/ friend can assist by either applying force on the pelvis with their hands or by standing on either end of the towel which has been placed across the pelvis.
- There are two chief uses for extension in lying with belt fixation. Firstly, in Derangement as a home treatment for those who respond well to extension in lying with clinician overpressure (procedure 6A).

- Secondly in extension Dysfunction, which the previous procedure will have helped to confirm. This is only used if previous procedures prove inadequate, and is designed for long-term home use.

## PROCEDURE 7 – EXTENSION MOBILISATION (IN NEUTRAL OR EXTENSION)

**Patient Position**
Neutral: The patient lies prone with arms at the sides, close to the side of the treatment table where the clinician is standing.
Extension: Patient resting on their elbows and forearms.

- The table is at a height that allows the clinician to apply a perpendicular force to the spine.

**Clinician Position**

- The clinician stands to one side of the patient
- The clinician crosses their arms, and places the heel of the hypothenar eminences on the transverse processes of the lumbar spine
- The hands are at 90 degrees to each other and are on the same spinal segment.
- The clinician's chest is over their hands so the line of force is perpendicular to the movement.
- No force is applied while positioning the hands.

*Procedure 7 – Extension mobilisation*

**Force Applied**

- Rhythmical pressure is applied through the arms using the body weight.
- The pressure is equal and symmetrical through both hands
- A small amplitude force is applied in a slow rhythmical way aiming to move further into range with each movement. Between repetitions pressure is released to the starting position but the skin contact is maintained.
- The mobilisation should be repeated up to ten times.

**Application**

- The procedure needs to take the lumbar spine to **end-range** extension in order to achieve the optimal effect
- The procedure can be performed with the patient in varying amounts of extension by the patient lying prone in extension or the clinician raising the head of the treatment table.

- This procedure is used when a force progression is required in the treatment of Derangement.
- Varying levels can be checked for the best symptomatic response.

## PROCEDURE 9 – EXTENSION IN STANDING (EIS)

### Patient position

- The patient stands with the feet shoulder width apart.
- The hands are placed in the small of the back.
- The patient then leans backwards as far as possible, using their hands as a fulcrum.
- The position is maintained for one to two seconds and then the patient returns to the neutral position.
- The patient repeats the movement in a rhythmical manner aiming to move further towards end range with each repetition.
- The movement should be repeated up to ten times

*Procedure 9 – Extension in standing*

### Application

- Extension in standing may be used with Derangements or Dysfunctions. This procedure is less likely to be appropriate or manageable if symptoms are severe or acute.
- Derangements that respond to the extension principle will rarely be completely reduced initially by extension in standing. This procedure is useful as a supplement to extension in lying.
- It is very important in the prevention of the onset of back pain during or after prolonged sitting or bending, and is very effective when performed proactively before pain is actually felt.

## PROCEDURE 10 – SLOUCH OVERCORRECT

**Patient position:**

- The patient sits in the fully slouched posture, then moves to the upright sitting posture, by anteriorly rotating the pelvis, accentuating the lordosis and lifting the chest until the lumbar spine is in maximal lordosis.
- The position is maintained for one to two seconds and then the patient returns to the slouched starting position.
- The movement should be performed in a rhythmical manner and repeated up to ten times.
- After completing the repetitions the patient should maintain the extreme upright position for one or two seconds, and then release about ten percent of the strain to find the correct sitting posture.

*Procedure 10 – Slouch overcorrect*

**Application**

- This procedure is used to educate patients with Postural syndrome, so they can attain the correct sitting posture.
- The procedure may also be useful for Derangement syndrome on certain occasions. It can be a helpful way of educating patients about posture correction, but also can be used as a method, in a loaded posture, of re-gaining flexion or extension if this is difficult in other positions.
- This procedure is also useful in Derangements in which directional preference alternates from extension to flexion.
- Posture correction (procedure 4) and slouch overcorrect may also useful procedures in patients with Mechanically Inconclusive presentations.

# EXTENSION PRINCIPLE WITH LATERAL COMPONENT

## PROCEDURE 11 – EXTENSION IN LYING WITH HIPS OFF CENTRE

### Patient position

- The patient starts in the prone lying position, with hands palm down under the shoulders.
- The patient and / or the clinician moves the hips off centre.
- The patient raises the top half of the body by straightening their arms, while the pelvis and thighs remain relaxed.
- The position is maintained for one to two seconds, and then the patient returns to the neutral position.
- The patient repeats the movement in a rhythmical manner aiming to move further towards end range with each repetition.
- The movement should be repeated up to ten times.

*Procedure 11 – Extension in lying with hips off centre*

### Application

- This is an extension procedure with an additional lateral force.
- With this procedure the hips are usually shifted away from the painful side, e.g. with right sided pain their hips are positioned off centre to the left.
- There will be a tendency to straighten up as the exercise is performed, an adjustment of the hips may need to be made after a number of repetitions.
- Used in Derangements that have unilateral or asymmetrical symptoms, and that have been worsened by, or not responded to, purely sagittal plane movements.

## PROCEDURE 12 – EXTENSION IN LYING WITH HIPS OFF CENTRE WITH CLINICIAN OVERPRESSURE (A: SAGITTAL – B: LATERAL)

### Patient Position (for both Procedure 12 A and 12 B)

- The patient starts in the prone lying position, with hands palm down under the shoulders.
- The treatment table is at a height that allows the clinician to apply a perpendicular force (for A: Sagittal) or lateral force (for B: Lateral) to the spine.
  The patient and / or the clinician moves the hips off centre towards the clinician

### Clinician Position

#### A. Overpressure in Sagittal Plane

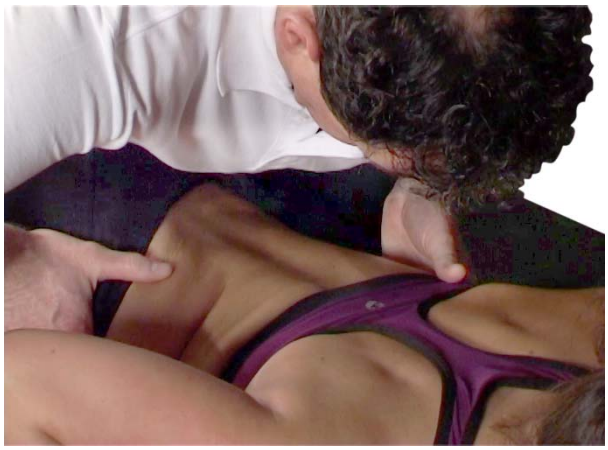
- The clinician stands to one side of the patient.
- The clinician crosses their arms, and places the heel of their hypothenar eminences on the transverse processes of the lumbar spine.
- The hands are at 90 degrees to each other and the hands are on the same lumbar segment.
- The clinician's chest is over the hands so the line of force is perpendicular to the movement.
- No force is applied while positioning the hands.
- Pressure is then applied through the arms using the body weight.
- Symmetrical pressure is applied and the uniform pressure is maintained, while the patient performs repeated extension in lying.
- The clinician moves with the patient in order to maintain a perpendicular force.
- Pressure is maintained throughout the movement and released when the patient returns to the starting position.
- The patient repeats the movement in a rhythmical manner aiming to move further towards end range with each repetition.
- The movement should be repeated up to ten times.

*Procedure 12 A – Extension in lying with hips off centre with clinician overpressure in Sagittal Plane*

**B. Overpressure in Lateral Plane**

- The clinician places one hand over the lower ribs and the other hand on the lateral pelvis.
- The forearms are parallel in line with the lateral force to be applied.
- The clinician's chest is over the patient's lumbar spine
- Pressure is applied evenly through both hands ensuring that the hips remain off centre while the patient performs extension in lying.
- The clinician's pressure is maintained throughout the movement. It may be released when the patient returns to the starting position or maintained until completion of the procedure.
- The patient repeats the movement in a rhythmical manner aiming to move further towards end range with each repetition.
- The movement should be repeated up to ten times.

*Procedure 12 B – Extension in lying with hips off centre with clinician overpressure in Lateral Plane*



**Application**

- Used if extension in lying with hips off centre leaves the symptoms, no better or no worse afterwards, or has no effect.
- Overpressure is applied to emphasise the sagittal or lateral component of the procedure as indicated by symptom response.
- It will only be applied in Derangements that have not changed or have been made worse by purely sagittal plane movements

## PROCEDURE 13 – EXTENSION MOBILISATION WITH HIPS OFF CENTRE

### Patient Position

- The patient lies prone with arms at their sides.
- The treatment table is at a height that allows the clinician to apply a perpendicular force to the spine.
- The patient lies close to the side of the table where the clinician is standing.
- The patient and / or the clinician moves the hips off centre towards the clinician.

### Clinician Position

- The clinician crosses their arms, and places the heel of their hypothenar eminences on the transverse processes of the lumbar spine
- The hands are at 90 degrees to each other and the hands are on the same spinal segment.
- The clinician's chest is over their hands so the line of force is perpendicular to the movement.
- No force is applied while positioning the hands.

### Force Applied

- Rhythmical pressure is applied through the arms using the body weight.
- The pressure is equal and symmetrical through both hands.
- A small amplitude force is applied in a slow rhythmical way aiming to move further into range with each movement.
- Between repetitions pressure is released to the starting position but skin contact is maintained.
- The mobilisation should be repeated up to ten times.

*Procedure 13 – Extension mobilisation with Hips off centre*

### Application

- This procedure is applied as a force progression during treatment of a Derangement with a lateral component.
- The patient will have been performing extension in lying with hips off centre and overpressure will already have been applied (procedures 11 and 12).
- Varying levels can be checked for the best symptomatic response.

## PROCEDURE 14 – ROTATION MOBILISATION IN EXTENSION

### Bilateral Technique

**Patient Position**

- The patient lies prone with their arms at the sides, close to the side of the treatment table where the clinician is standing.
- The table is at a height that allows the clinician to apply a perpendicular force to the spine.

**Clinician Position**

- The clinician crosses their arms and places the heel of their hypothenar eminences on the transverse processes of the lumbar spine.
- The hands are at 90 degrees to each other and on the same spinal segment.
- The clinician's chest is over their hands so the line of force is perpendicular to the movement.
- No force is applied while positioning the hands.

**Force Applied**

- Gentle perpendicular pressure is applied to one side and then fully released while bilateral contact is maintained.
- Gentle perpendicular pressure is then applied to the opposite side and then fully released.
- A rhythmical rocking effect is obtained by repeating equal pressure on alternate sides.
- Pressure is achieved by applying body weight through the arms.
- The force is directed anteriorly and slightly medially.
- A small amplitude alternating force is applied in a slow rhythmical way aiming to move further into range with each movement.
- Between repetitions pressure is released to the starting position but skin contact maintained.
- The mobilisation should be repeated up to ten times.

*Procedure 14: Bilateral Technique: Rotation Mobilisation in Extension*

## Unilateral Technique

### Patient Position

- The patient lies prone with arms at the sides, close to the side of the table where the clinician is standing.
- The table is at a height that allows the clinician to apply a perpendicular force to the spine.

### Clinician Position

- The clinician stands on the opposite side to be mobilised.
- The clinician places the heel of one hand on the transverse process on the opposite side of the spine, then places the other hand on top.
- The clinician's chest is over their hands so the line of force is perpendicular to the movement.
- No force is applied while positioning the hands.

### Force Applied

- Gentle pressure is applied, and then fully released while contact is maintained
- Pressure is achieved by applying body weight through the arms.
- The force is directed anteriorly and slightly medially.
- A small amplitude force is applied in a slow rhythmical way aiming to move further into range with each movement.
- Between repetitions pressure is released to the starting position but skin contact maintained.
- The mobilisation should be repeated up to ten times.

*Procedure 14: Unilateral Technique: Rotation Mobilisation in Extension*

### Application

- This procedure produces a localised extension / lateral force, and is used when a force progression is required in the treatment of Derangement requiring a lateral force applied with the lumbar spine in an extended position.

# LATERAL PRINCIPLE

## PROCEDURE 16 – SIDE GLIDING OR SELF-CORRECTION OF LATERAL SHIFT

The direction of side gliding is described by the direction the shoulders move in relation to the pelvis, NOT the direction the pelvis moves.
The side gliding procedure, which can also be used for self-correction of a lateral shift, can be performed in several different ways. The procedure can be performed in standing, against a wall, or in a doorway.

**Standing**

- The patient stands with their feet shoulder width apart
- The patient is instructed to glide their hips laterally while attempting to keep their shoulders level with the floor.
- The patient can guide the movement by applying pressure with one hand on the rib cage and one hand on the pelvis on the opposite side.
- The clinician may also guide the patient's movement by applying one hand on the shoulder and one hand on the pelvis of the opposite side.
- The position is maintained for one to two seconds, and then the patient returns to the starting position.
- The patient repeats the movement in a rhythmical manner aiming to move further towards end range with each repetition.
- The movement should be repeated up to ten times.
- The side gliding movement is generally followed by extension in standing.

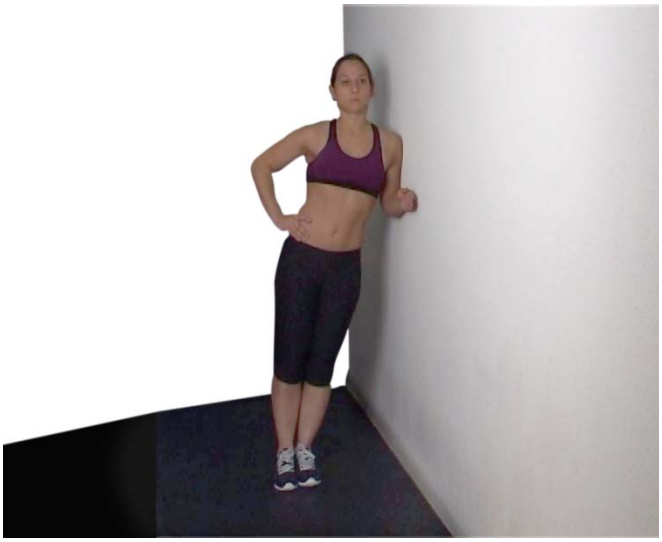
*Procedure 16 – Self-correction of lateral shift or side gliding*
*'Free Standing'*

**Against a Wall**

- The patient stands with the pain free side against a wall (if shift present, this would be for a contralateral shift).
- The patient leans the shoulder against the wall with the elbow bent (elbow above the iliac crest).
- The feet are placed together at a distance out from the wall.

- The pelvis is pushed towards the wall using the outer hand.
- The position is maintained for one to two seconds, and then the patient returns to the starting position.
- The patient repeats the movement in a rhythmical manner aiming to move further towards end range with each repetition.
- The movement should be repeated up to ten times.
- Greater amounts of side gliding are achieved by moving the feet further away from the wall or by placing a pillow between the shoulder and the wall.
- Once the movements are completed the patient should step the inner leg back towards the wall and return to neutral standing.
- The side gliding movement is generally followed by extension in standing.

*Procedure 16 – Self-correction of lateral shift or side gliding*
*'Against a Wall'*



**Doorway**

- Alternatively the procedure can be performed in a doorway of a suitable width.
- The patient stands in the middle of the doorway with the feet shoulder width apart and stabilises the upper trunk by placing the forearms against the doorframe.
- Maintaining this position, the patient moves the hips laterally towards the doorframe. The position is maintained for 1 to 2 seconds, and then the patient returns to the starting position.
- The patient repeats the movement in a rhythmical manner aiming to move further towards end range with each repetition.
- The movement should be repeated up to ten times.
- The side gliding movement is generally followed by extension in standing.

**Application**

- The doorframe provides stability of the upper trunk and thus allows the shoulders to remain parallel to the floor.

- The self-correction of lateral shift or side gliding procedure is generally only applied to Derangements.
- It is taught after the manual correction of lateral shift (procedure 17) to ensure that the patient is able to maintain improvements and prevent recurrences. It may also be used for patients without a lateral shift but respond to the lateral principle.
- Having corrected the lateral shift and the obstruction to extension, it is essential to teach the patient to perform self-correction by side gliding in standing followed by extension in standing.
- The side gliding movement may also be applied to 'soft' lateral shifts.
- It is also applied to Derangements that do not present with a lateral shift deformity, but that are either unchanged or worsened by extension principle procedures, and where treatment is with the lateral principle. (Symptoms are centralised or better with lateral forces.)

*Procedure 16 – Self-correction of lateral shift or side gliding in door way*

## PROCEDURE 17 – MANUAL CORRECTION OF LATERAL SHIFT

The direction of lateral shift is described by the direction the shoulders are displaced. Thus, when the patient stands with their upper body shifted to the right, and hips to the left, this is a right lateral shift. This procedure has two parts: first the deformity of lateral shift is corrected, then, if present, the deformity of kyphosis is reduced and full extension is restored. It is very important to monitor symptom response at all times during this procedure. An increase of peripheral pain indicates a modification is required; for instance altering the angle of flexion/extension. If no modification can be found to centralise or make the symptoms better, the manoeuvre should be abandoned.

**This procedure has two parts; First the deformity of lateral shift is corrected and then extension is restored.**

**Patient Position**

- The patient stands with the feet shoulder width apart, attempting to weight bear evenly.
- The arms are at their sides with the elbow on the side they are shifted towards bent to 90 degrees, above the ilium.

**Clinician Position**

- The clinician also stands on the side the patient is shifted towards and places their superior/anterior shoulder against the patient's arm just above the elbow.
- The clinician is in the stride standing position, feet wide apart with their forward leg in front of the patient.
- The clinician should maintain a neutral back position with knees bent.
- The clinician interlocks their fingers over the patient's ilium, ensuring the patients arm is clear of their ilium.
- The clinician's head is behind the patient.

*Procedure 17 – Manual correction of lateral shift*

**Force Applied**

- The clinician presses their anterior shoulder against the patient's bent arm pushing the trunk away and pulls the patient's pelvis toward them.
- These two movements are performed equally and simultaneously which produces a side gliding movement.
- The clinician first attempts to centre the weight bearing before then shifting the patient's weight to the opposite leg. The movement is smooth, slow and rhythmical. The movement is of a small amplitude, and the pressure is held for 3 to 5 seconds. (The pressure may be sustained if symptoms do not reduce)
- The pressure is released slightly and then each further force proceeds further into range.
- End range of the side glide movement should be achieved.

**Restoring the Lumbar Lordosis**

- The clinician then releases some pressure, but some over correction of the shift is maintained as the patient extends.
- The movement is controlled by the patient putting their free hand behind their back, and by the clinician.
- It may be necessary for the patient's pelvis to move forward to ensure that they maintain their balance.
- The clinician may move their back leg behind the patient for further stability.
- The position is maintained for one to two seconds, and then the patient returns to the starting position.
- The movement occurs in a rhythmical manner aiming to move further towards end range with each repetition.
- The movement should be repeated as required.

**Application**

- This procedure is only used for a particular sub-group of Derangements that require the lateral principle AND have an acute lateral shift deformity. The patient will be fixed in, for instance, a right lateral shift, and will be unable without clinician assistance, to maintain correction of the deformity. In this instance, where patient generated forces (procedure 16) alone are unable to alter the mechanical or symptomatic presentations, then clinician-generated forces must be used to bring about a situation that the patient is able to self-manage.
- Some patients, with a 'soft' shift are able to achieve shift correction independently, but those with a 'hard' shift will need clinician assistance.
- Following manual correction of a lateral shift it is essential that patients be taught self-correction of a lateral shift (procedure 16) so they are able to maintain improvements and prevent recurrences.

# FLEXION PRINCIPLE

## PROCEDURE 18 – FLEXION IN LYING (FIL)

### Patient position

- The patient lies supine with their knees and hips flexed about 45 degrees and their feet flat on the table.
- The patient brings their knees up towards their chest, applying overpressure with their hands around their knees to achieve maximum possible flexion.
- The position is maintained for one to two seconds and then the knees are released and the feet are placed back on the table in the starting position.
- The movement occurs in a rhythmical manner aiming to move further towards end range with each repetition.
- The movement should be repeated up to ten times.

*Procedure 18 – Flexion in lying*

### Application

- Flexion in lying is used in several circumstances.
- Reduction of Derangements that respond to the flexion principle.
- Remodelling of flexion Dysfunctions.
- Flexion in lying is used in the recovery of function stage of the management of Derangements that respond to the extension principle, to test the stability of reduction.
- The first few flexion stresses should be applied cautiously; as long as the symptom response is satisfactory, overpressure may be applied more strongly with each movement, and maximally on the last repetitions.
- Flexion in lying can also be used as a provocative manoeuvre if earlier mechanical evaluation has been inadequate. A worsening of symptoms with repetitive flexion suggests that a Derangement with an extension principle may be present and extension should be explored.

## PROCEDURE 19 – FLEXION IN SITTING (FI SITTING)

**Patient position**

- The patient sits at the front of an upright chair with their legs apart, with knees and hips at 90 degrees.
- The patient then bends forward putting their head between their knees.
- The position is maintained for 1 to 2 seconds and then the patient returns to the starting position.
- The movement occurs in a rhythmical manner aiming to move further towards end range with each repetition.
- The movement should be repeated up to ten times.

**Overpressure:**

- Overpressure can be applied by the patient using both hands to pull on the ankles, or by pulling on the legs of the chair.

*Procedure 19 – Flexion in sitting*

**Application**

- This procedure is used in the reduction of Derangements responding to the flexion principle.
- This procedure may also be used in the remodelling process for Adherent Nerve Root. When used for this purpose the legs can gradually be placed in a more extended position, which will have the effect of enhancing the stress upon the affected tissue.

## PROCEDURE 20 – FLEXION IN STANDING (FIS)

### Patient position

- The patient stands with the feet shoulder width apart, ensuring there is a good base of support.
- The patient places their hands on the front of their thighs, and then runs the hands down the front of the legs, maintaining straight knees all through the movement.
- The position is maintained for 1 to 2 seconds and then patient returns to the starting position.
- The movement occurs in a rhythmical manner aiming to move further towards end range with each repetition.
- The movement should be repeated up to ten times.

*Procedure 20 – Flexion in standing FIS*

### Application

- Flexion in standing should be applied initially whilst closely monitoring the symptomatic response.
- Flexion in standing has several applications.
- It may be used as a progression from previous flexion procedures in the reduction of Derangements requiring the flexion principle.
- It is also the necessary loading strategy for management of an Adherent Nerve Root.
- Flexion in standing should also be tested in the later stages of recovery of function following reduction of Derangements, requiring the extension principle.
- This procedure is also useful in Chronic Pain Syndrome patients who have developed fear-avoidance towards activity.

## PROCEDURE 21 – FLEXION IN LYING (FIL) WITH CLINICIAN OVERPRESSURE

### Patient Position

- The patient lies supine with their knees and hips flexed about 45 degrees and their feet flat on the treatment table, close to the side of the table where the clinician is standing.
- The patient brings their knees up towards their chest applying overpressure with their hands around the knees to achieve maximum possible flexion.

### Clinician Position

- The clinician stands on one side of the table. The table is at a height that allows the clinician to apply overpressure by pushing the patient's knees and legs towards the chest.
- The clinician applies overpressure by pushing the patient's knees and legs towards their chest.
- The position is maintained for 1 to 2 seconds and then the knees are released and the feet are placed back on the table in the starting position.
- The movement occurs in a rhythmical manner aiming to move further towards end range with each repetition.
- The movement should be repeated up to ten times.

*Procedure 21 – Flexion in lying with clinician overpressure*

### Application

- Progression of force from Flexion in Lying with patient overpressure where a stronger flexion force is required.

# FLEXION PRINCIPLE WITH LATERAL COMPONENT

## PROCEDURE 22 – FLEXION IN STEP STANDING (FISS)

- The patient stands with one foot on the floor with the leg straight and one foot on a stool with the knee and hip flexed at about 90 degrees.
- The straight leg remains fully extended at the knee throughout the procedure.
- The patient bends forward, keeping the trunk inside the raised leg so that the shoulder approximates the raised knee.
- The patient may apply more pressure by grasping the ankle of the raised leg and pulling themselves further into flexion so that the shoulder passes below the raised knee.
- The position is maintained for 1 to 2 seconds then the pressure is released and the patient returns to the upright position.
- The movement occurs in a rhythmical manner aiming to move further towards end range with each repetition.
- The movement should be repeated up to ten times.

*Procedure 22 – Flexion in step standing FISS*

**Application**

- This procedure causes an asymmetrical flexion stress, and is applied when there is a deviation in flexion, which may be present in Derangement or in Dysfunction (most commonly Adherent Nerve Root). In both syndromes the leg to be raised is that opposite to the side to which deviation in flexion occurs – for example, for deviation in flexion to the left the right leg is raised.

## PROCEDURE 23 – ROTATION IN FLEXION

- The patient lies supine with the knees and hips flexed about 45 degrees and the feet flat on the table.
- The patient then flexes the hips and knees to at least 90 degrees and lowers the knees laterally to the table.
- The position is sustained for up to three minutes and can be interrupted by a return to the starting position at regular intervals.

### Application

**Note: Although listed as a 'flexion principle' procedure, Rotation in Flexion (Procedures 23 & 24) is most commonly used for those patients with lumbar Derangements who at some point will likely need to return to the sagittal plane and will then respond to extension procedures**

- This procedure is used in the management of Derangements that have not improved with sagittal plane manoeuvres.
- These Derangements require a lateral force applied with the lumbar spine in a flexed position.
- The knees are most commonly rotated toward the painful side.

*Procedure 23- Rotation in flexion*

## PROCEDURE 24 – ROTATION IN FLEXION MOBILISATION (SUSTAINED)

### Patient Position

- The patient lies supine with knees and hips flexed about 45 degrees and feet flat on the bed
- The patient lies close to the side of the table to which their legs will be rotated.

### Clinician Position

- The clinician is in stride, facing the patient on the side to which the legs are to be rotated.
- The inner leg is forward.
- The table is at a height that allows the clinician to lower the patient's knees.

### Force Applied

- The clinician flexes the patient's hips and knees.
- Hips are flexed to at least 90 degrees.
- The knees are lowered over the side of the table until the patient's lower leg rests on the clinician's upper thigh.

*Procedure 24 - Rotation Mobilisation in Flexion*

- The clinician places their hand closest to the table on the patients opposite shoulder or lower ribs
- The clinician applies a downward pressure on the knees with one hand stabilising the patient's trunk with the other hand.
- The position is sustained for up to 3 minutes and can be interrupted by a return to the starting position at regular intervals.
- The clinician then returns the legs to the 90 degree hip position.

*Procedure 24 - Rotation Mobilisation in Flexion*

**Application**

- This procedure is used in the management of Derangements that have not improved with sagittal plane manoeuvres.
- These Derangements require lateral force applied with the lumbar spine in a flexed position.
- This procedure is the progression from the one above.
- The patient's pelvis may be placed off centre (away from the side of pain) with assistance from the clinician before flexing the hips and knees to 90 degrees as an alternative progression.
- This procedure may also be done as an intermittent procedure with pressure on and off at the end of range

# NOTES FOR MODULE EIGHT

# MODULE EIGHT

## QUIZ

**What classifications are treated by the following lumbar procedures?**

1. Extension in lying

2. Flexion in standing

3. Prone lying/sustained extension

4. Flexion in lying

5. Extension in standing

6. Extension in lying with hips off centre to the right

7. Flexion in step-standing

8. Side gliding in standing against the wall

# MODULE NINE

## MANAGEMENT OF DERANGEMENT SYNDROME

### Objectives

By participating fully in this module, a participant will be able to:

1. Identify and explain the four stages of management of a Derangement.

2. Describe the essential management principles for each stage of Derangement.

3. Describe the indications for the progression of forces required in the management of the Derangement Syndrome.

4. Discuss the specific management pathways for the three sub-classifications of Derangement – central or symmetrical symptoms, unilateral or asymmetrical to the knee and unilateral or asymmetrical below the knee.

# MODULE NINE

## MANAGEMENT OF DERANGEMENT SYNDROME

**1. Identify and explain the four stages of management of Derangement.**

i) Reduction of Derangement
ii) Maintenance of reduction
iii) Recovery of function
iv) Prevention of recurrence

**2. Describe the essential management principles for each of the stages of the management of Derangement.**

**i) Reduction – key aspects:**

- Identification of the treatment principle that is found to decrease, centralise or abolish the symptoms and which leaves the patient better as a result And also improves range and function
- Regular performance of self-management exercise until all symptoms are abolished and both range and function are fully restored
- Regular monitoring of posture to assist reduction
- Force progressions only necessary if no initial improvement or improvement ceases
- Re-evaluation of treatment principle only necessary if improvement plateaus.

**Education component**

- Information is key in giving control to the patient
- Needs to be relevant to the individual
- Combine with practical strategies
- Patient should not simply be a passive recipient of this information
- Clinician should take advantage of educational opportunities as they arise throughout each treatment episode
- Consider:
  - Patient's willingness to take ownership
  - Patient's capacity to retain details
- A lot of information is forgotten, therefore:
  - Keep it clear and simple
  - Repeat the main items in ways that facilitate learning
  - In order to learn techniques the patient must see, practice and repeat them
- Encourage patients to problem solve
- Encourage patients to learn how to control their symptoms

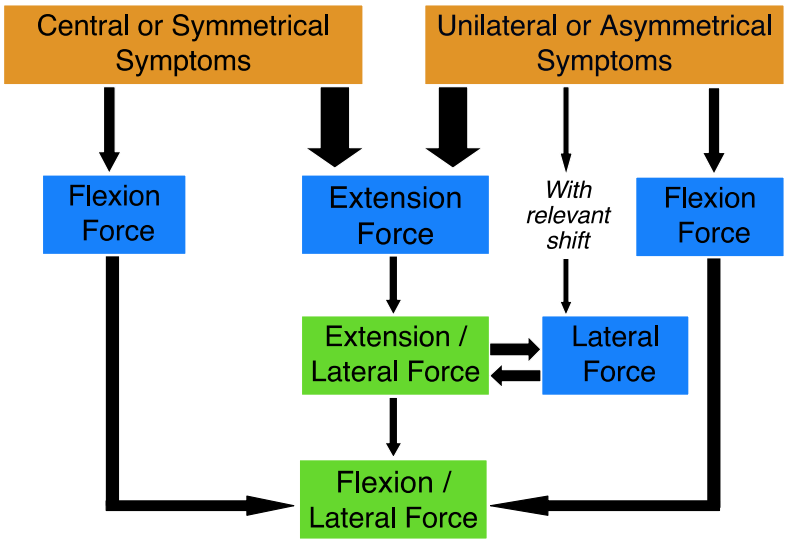
**Mechanical therapy component**

**Treatment principles**

- Extension principle
- Lateral principle
- Flexion principle

## DERANGEMENT SYNDROME

## TREATMENT PRINCIPLES




**ii) Maintenance of reduction**

For effective maintenance of reduction education is the primary focus. The patient must be able to maintain any improvements gained during a treatment session, and also to reverse any deterioration that may happen during normal daily activity. If the patient fails to sufficiently understand the importance of maintenance it is likely the clinician has failed to do their job thoroughly.

**Maintenance of reduction – key aspects:**

- regular performance of the reductive procedure
- postural correction, including the use of a lumbar roll if relevant.
- avoidance of aggravating postures, positions and /or movements
- regular interruption of sustained postures.

**iii) Recovery of function**

It is essential to reintroduce normal movements in all directions following the successful reduction of a Derangement. Flexion is a movement that the patients are sometimes initially fearful of performing, so it is important that the clinician demonstrates that at this time in the management process it can be reintroduced safely. This will help to address some potential fear-avoidance issues.

Determining if a Derangement is sufficiently stable to commence recovery of function.

- monitor symptomatic response –
  - end-range symptoms produced, no worse
  - symptoms may become less painful on repetition

- symptoms should *not* be felt *during* the movement
- symptoms must *not* be produced, worse
- symptoms produced must *not* become more painful on repetition
- symptoms must *not* peripheralise

- monitor mechanical response –
  - extension range of motion must remain unchanged following repeated flexion

**Introducing flexion (where extension is the treatment principle)**

- Commence with unloaded flexion procedures, and progress as this procedure is established to be safe, or when restoration of flexion has plateaued.
- Perform new exercises initially with only 5/6 repetitions, 5/6 times per day.
- Avoid flexion procedures within first few hours of waking - during this time period the disc is likely to be under increased pressure as a result of nocturnal re-absorption of fluid and is more vulnerable to re-derange.

Other movements may also need to be included in the recovery of function (e.g. side gliding in a patient who has had a lateral shift) but flexion is the most common movement required.

**Recovery of function – key aspects**

- All movements must be made full range and pain free after reduction of Derangement
- Patients should be made confident to bend and perform other normal activities
- Restoration of flexion should proceed in stages, as above
- Mobility into extension should remain unchanged after repeated flexion
- Recovery of function is rarely required in anterior Derangement.

**iv) Prevention of recurrence**

Advice concerning low back care in the future is always given to the patient during the course of treatment and prior to discharge. This should include discussion of the following aspects: recurrent nature of back pain, avoiding prolonged aggravating postures, practice of prophylactic exercises, and importance of general fitness.

**Prevention of recurrence – key aspects:**

- Continuance of exercise programme for as long and as frequently as required to maintain full mobility
- Beware of sustained postures
- Balancing flexion with extension with daily activities
- Lifelong use of lumbar roll
- Importance of general fitness
- Resumption of reductive exercises if stiffness, loss of motion or back pain re-occurs.

**3. Describe the indications for the progression of forces required in the management of the Derangement Syndrome**

**The indications for the force progressions**

- If symptoms do not remain better or centralise with current force application.
- Or if improvement plateaus with current force application.
- It is important to ensure that the symptoms have not returned due to poor posture or other patient compliance issues.

**4. Discuss the specific management pathways for the three sub-classifications of Derangement – central or symmetrical symptoms, unilateral or asymmetrical to the knee and unilateral or asymmetrical below the knee.**

## CENTRAL OR SYMMETRICAL SYMPTOMS – MANAGEMENT GUIDELINES

**EXTENSION PRINCIPLE: (Posterior Derangements)**

**Procedures for reduction**

- Lying prone (procedure 1) –This is an essential initial procedure when the time factor is important and a quick progression to repeated extension may be premature – pain may initially be present in this position, but then reduce or disappear over four to five minutes
- Lying prone in extension (procedure 2) – May be recommended as a position of rest, for instance for reading or watching television as an alternative to lounging on the sofa. This is an essential procedure when time is a factor and sustained loading is required prior to the use of repeated movements – pain may initially be present in this position, but then reduce or disappear over four to five minutes.
- Extension in lying (procedure 5) – Always required to achieve full reduction.
- Extension in standing (procedure 9) – Often useful when reductive process is underway.

<u>Dosage</u>

- Approximately 10 x every 2-3 hours, but individual to the patient
- Also as “First Aid” should symptoms return between the prescribed sessions

<u>Expected response</u>

- Pain is centralised or better as a result
- Possible increase of central pain
- Increase in range of extension, flexion and side gliding
- May cause temporary new pains

<u>Possible progressions</u>

- Extension in lying with clinician overpressure (procedure 6A) or use of seat belt (procedure 6B)
- Extension mobilisation (procedure 7)
- Extension mobilisation further into physiological range of extension
- Extension manipulation

**If Kyphotic deformity is present***: use of sustained extension procedures is required as time is a factor. It is commonly required to initiate reduction by accommodating the deformity with the use of pillows, the number is gradually reduced as symptoms allow. Then procedures 1-3 are introduced to continue the reductive process.*

**Procedures for maintenance of reduction**

- Regular performance of the reductive exercise (see procedure 5)
- Maintenance of lordosis during transition movements is important e.g. as the patient moves from sitting to standing
- Posture maintenance is essential
- Caution with repeated or sustained flexion, particularly if it is a significant aggravating factor in the patient's History.

**FLEXION PRINCIPLE: (Anterior Derangements)**

**Procedures for Reduction**

- Flexion in lying (procedure18) – Most common initial reductive procedure. Once this movement becomes unobstructed, flexion in sitting can be utilised.
- Flexion in sitting (procedure 19) This is easier to perform during daily activities

Dosage

- Approximately 10 x every 2-3 hours, but individual to the patient
- Also as "First Aid" should symptoms return between the prescribed sessions

Progressions - Usually required after a few days

- Flexion in sitting (procedure 19) – If not already introduced on day one
- Flexion in standing (procedure 20)
- Flexion in lying with clinician overpressure (procedure 21)

***If Lordotic deformity is present****: use of the reductive sequence as above is required*

**Maintenance of reduction**

- Regular performance of the reductive exercise
- Posture correction – Reduction of lordosis
- Avoidance of lordotic postures – e.g. prone lying, prolonged standing

## UNILATERAL OR ASYMMETRICAL TO KNEE: MANAGEMENT GUIDELINES

**Procedures**
Start with extension procedures as described for central or symmetrical symptoms

| RESPONSE TO EXTENSION FORCES | IMPLICATIONS |
|---|---|
| Centralised or Better | Continue with extension forces |
| Peripheralised or Worse | Introduce lateral component |
| Inconclusive response<br>No Worse, No Better or No effect | Explore lateral component and then decide on the most appropriate force |

**Indicators that suggest lateral forces may be needed in management**

Certain features of history provide clues as to the possibility of a relevant lateral component:

- Unilateral or asymmetrical symptoms
- Activities of both flexion and extension aggravate symptoms

**Certain features of the physical examination provide clues as to the possibility of a relevant lateral component:**

- Worse or peripheralise with posture correction
- Lateral movement is asymmetrical, with major loss in one direction.
- Symptoms peripheralise, worsen, or are unchanged with prone lying or extension in lying. (As long as sufficient time was allowed for extension procedures and force progressions were not introduced too rapidly)
- Symptoms are overall unchanged after several days' application of extension protocol.

A relevant lateral component is confirmed when symptoms centralise or are made better by lateral movements. It is important to assess the response to lateral forces early when this seems appropriate. Equally it is important on other occasions to make sure that the sagittal plane is not abandoned prematurely, and that an extended mechanical evaluation and force progressions are conducted.

**Use of the lateral component in patients with a relevant lateral component but no lateral shift**

Where lateral forces are required possible procedures and progressions are:

- Extension in lying with hips off centre (procedure 11).
- Extension in lying with hips off centre with clinician overpressure (procedure 12), overpressure may be applied either to emphasise the sagittal or lateral component of the procedure.
- Extension mobilisation with hips off centre (procedure 13).
- Rotation mobilisation in extension (procedure 14).
- Side gliding in standing (procedure 16).
- Side gliding in standing with clinician overpressure (procedure 16).
- Rotation in flexion (procedures 23).
- Rotation mobilisation in flexion (procedures 24).

Following use of lateral forces symptoms may centralise completely, and pure sagittal plane forces are then re-considered.

**Presence of lateral shift deformity – lateral principle will be required**

- **The 'soft' lateral shift** - The lateral shift will have accompanied the recent onset of back pain. The patient will present with a very visible lateral deformity that they are initially unable to self-correct. On repetition of side-gliding techniques these patients can achieve self-correction without clinician assistance.
- **The 'hard' lateral shift -** The lateral shift will have accompanied the recent onset of back pain. The patient will present with a very visible lateral deformity that they are unable to self-correct. They will be unable to bring their shoulders and hips back to the middle, or if they can will not be able to maintain correction. These patients will need clinician assistance.

**Lateral principle in the presence of a soft or hard lateral shift**

Procedures used initially are:

- Self-correction of lateral shift (procedure 16) – 'soft' deformity
- Manual correction of lateral shift (procedure 17) – 'hard' deformity

## UNILATERAL OR ASYMMETRICAL BELOW KNEE: MANAGEMENT GUIDELINES

**SYMPTOMS LESS THAN 8 - 12 WEEKS – essential to differentiate between Derangement and Mechanically Unresponsive Radiculopathy**

### 1. Derangement

Assessment

- From the history and physical examination of the patient with constant leg pain, it may become apparent that centralisation or a lasting improvement of pain is possible. This conclusion can be supported when the patient centralises or remains better with extension or lateral procedures, and lordotic sitting postures.

Management

- The same procedures are applied as with unilateral pain to knee

### 2. Mechanically Unresponsive Radiculopathy - MUR

Assessment

- When, during the initial mechanical evaluation of patients with leg pain, all movements cause an increase in radiating pain and no position can be found to provide lasting relief, it is likely that we are dealing with a Mechanically Unresponsive Radiculopathy. Should further evaluation on successive days confirm that finding, additional attempts at reduction should be abandoned. (See Differentiation table)

Management

- One to three weeks of relative rest and pain medication may assist in the reduction of pain.
- Following this further evaluation should be performed, but a course of treatment can be justified only if it becomes possible to affect the symptoms.
- Surgery is usually only considered after failure of conservative treatment. The timeframe for surgical intervention will be country specific.
- The first two to three months are usually the most severe, if the patient can tolerate this period then surgery may be avoided. The patient should be encouraged to remain active and commence a programme of general exercise during the period of recovery, so that function is maintained.

## SYMPTOMS LONGER THAN 8 - 12 WEEKS

If leg pain persists beyond 8 – 12 weeks it is possible for the symptoms to arise from several causes, the most common of which are:

1. Derangement.
2. An Adherent Nerve Root (ANR)
3. Mechanically unresponsive radiculopathy

### 1. Derangement (symptoms most commonly intermittent but can be constant)

The same procedures are applied as for less than 12 weeks.

### 2. Adherent Nerve Root – ANR (symptoms will be intermittent)

A cause of intermittent persisting leg pain is an ANR. Constant leg pain becomes intermittent as an ANR develops. If the ANR resulted from a previous Derangement the symptoms will have improved from onset, but will have plateaued. It should be remembered that an adherent nerve root may be developing or fully developed depending on the time since onset that the patient is assessed. The longer symptoms have been present the longer remodelling will take; a developing ANR may resolve much more quickly.

When to suspect an ANR

If the history reveals leg symptoms that have not fully resolved after 8-12 weeks and the range of flexion in standing remains painfully limited and unchanging, an ANR may be suspected. Patients who remain cautious of resuming normal activity and movement are likely candidates for this complication. ANR also occurs sometimes in patients who have had surgery for radicular symptoms and have not received the appropriate rehabilitation exercise programme. The MDT assessment aims to differentiate between intermittent leg pain resulting from a Derangement and an ANR. If ANR is the cause of the remaining symptoms such patients should be provided with a structured exercise programme designed to remodel any structures that are adherent or contracted.

<u>Management</u>

See Module 10 Dysfunction

### 3. Mechanically Unresponsive Radiculopathy (symptoms most commonly constant but may be intermittent)

The same management principles are applied as for less than 12 weeks.

.

## Differentiating between a Derangement, a Mechanically Unresponsive Radiculopathy and an Adherent Nerve Root in patients with persistent leg pain

| CLINICAL PRESENTATION | DERANGEMENT | MECHANICALLY UNRESPONSIVE RADICULOPATHY | ADHERENT NERVE ROOT |
|---|---|---|---|
| **Stage** | Acute to chronic | Acute to chronic | Chronic |
| **Status** | Improving / Unchanging worsening / | Unchanging | Unchanging |
| **Symptoms** | Constant / intermittent | Commonly constant | Intermittent |
| **Symptom behaviour** | Variable | Consistent | Consistent |
| **Aggravating factors** | Flexion activities OR flexion and extension activities | Most activities temporary aggravation | Tension position produces, no worse; e.g. flexion, long sitting, driving, walking |
| **Problems with curve reversal** | Yes / no | No | No |
| **Relieving factors** | Extension or rarely lateral activities.<br>Lying | No activities. Some relief from on the move or unloading. | Avoidance of aggravating factors |
| **Episodic** | Yes / no | No | No |
| **Deviation in Flexion** | Contralateral > Ipsilateral | Contralateral/ipsilateral | Ipsilateral |
| **Loss of Flexion** | Variable<br>Minor to major | Moderate to major | Moderate to major |
| **Loss of Extension** | Variable<br>Often moderate to major | Variable | No |
| **Repeated Movements** | | | |
| **Flexion in Standing** | Worse or peripheralise<br>PDM / ERP<br>Mechanically worse | Increase, NW or W<br>No mechanical change | Produce, no worse<br>ERP<br>No mechanical change |
| **Extension in Standing** | Better or centralise and mechanically better.<br>Worse or peripheralise and mechanically worse | Increase, NW or W<br>No mechanical change | No effect<br>No mechanical change |
| **Flexion in Lying** | Response similar to flexion in standing, but often less severe | Increase, NW or W<br>No mechanical change | No effect<br>No mechanical change |
| **Extension in Lying** | Better or centralise<br>ROM better OR worse or peripheralise* | Increase, NW or W<br>No mechanical change | No effect<br>No mechanical change |

PDM = Pain during movement
ERP = End range pain
ROM = Range of movement, and other mechanical presentation.
* With this response lateral plane is investigated.

# NOTES FOR MODULE NINE

# MODULE NINE

## Quiz

**Answer the following questions:**

1. What are the stages of management for the Derangement Syndrome?

2. Why is the management of some Derangements unsuccessful? Give at least three reasons.

3. When would it be necessary to implement clinician techniques on day one with a Derangement that has a directional preference for extension?

4. When is it necessary to introduce clinician technique in a patient with Derangement with asymmetrical symptoms to the knee? Which procedures would you use?

5. When should you start flexion following reduction of a posterior Derangement?

6. What safeguards does the patient need to consider when introducing flexion following reduction of a posterior Derangement?

7. A patient has a left ipsilateral shift. Which treatment procedures would you be likely to use for this patient?

8. What are the principles of management of a patient with an anterior Derangement?

9. In the case study provided, discuss the indicators that support the presence of a relevant lateral component?

# MODULE TEN

## MANAGEMENT OF DYSFUNCTION SYNDROME

### Objectives

By participating fully in this module, a participant will be able to:

1. Describe and explain the management of the lumbar Dysfunction Syndrome.

2. Explain the essential principles of self-management and of patient responsibility necessary to achieve optimal outcomes.

3. Design a typical management programme for a Lumbar Extension Dysfunction which includes an educational component and an active mechanical component.

4. Describe the clinical features of an Adherent Nerve Root and discuss a typical management programme for this type of Dysfunction.

# MODULE TEN

## MANAGEMENT OF DYSFUNCTION SYNDROME

**1. Describe and explain the management of the Lumbar Dysfunction.**

In the Dysfunction Syndrome the therapeutic procedure chosen is the one that consistently produces the patient's pain at limited end range as this movement will gradually remodel the impaired soft tissues. The movement chosen will reproduce the symptoms on each repetition but these symptoms will abate shortly after the movement ceases.

**2. Explain the essential principles of self-management and of patient responsibility necessary to achieve optimal outcomes.**

Instructions given to patients with Dysfunction Syndrome:

- Exercises must be performed regularly throughout the day, every two to three hours.
- If patients are unable to exercise as regularly as recommended recovery of full function is likely to take longer.
- At each session perform ten to fifteen repetitions.
- If the exercise does not produce their pain it has not been performed correctly
- The exercise must consistently reproduce their pain with each repetition.
- The pain should subside within ten minutes after the completion of the exercises, usually it will abate much quicker.
- If pain from the re-modelling procedures persists and remains constant afterwards for a longer period either over-stretching has occurred, in which case repetitions must be reduced, or the original classification was incorrect or has changed. In either case a review is necessary.
- If the patient feels they are getting worse they must stop exercising and return for a review appointment.
- The patient should not expect a rapid change in the range of movement. If they experience a dramatic change in pain, function or range they must return for re-evaluation.
- If there is a spread of pain distally or a rapid deterioration in their condition they must stop exercising and return for a review appointment.

**3. Design a typical management programme for a lumbar Extension Dysfunction, which includes an educational component and an active mechanical component.**

Module Ten Quiz activity

**4. Describe the clinical features of an Adherent Nerve Root and describe a typical management programme for this type of Dysfunction.**

**Adherent Nerve Root – Clinical presentation (all will apply)**

History

- History of sciatica or surgery in the last few months that has improved, but now the leg symptoms are intermittent and unchanging
- Consistent activities produce symptoms – typically touching toes, long sitting, walking up hill or with a long stride
- Leg pain does not persist when movement has ceased

Physical examination

- Flexion in standing is clearly restricted and consistently produces concordant leg pain or tightness in the leg at end-range, and
- There is no rapid reduction or abolition of symptoms, nor is there a lasting production of distal symptoms.
- Flexion movement will be observed to improve if knee on involved side is flexed.
- Flexion in lying has no effect on leg symptoms.
- There will be no rapid changes in the mechanical presentation with repeated movement testing.

Management

- Aim is to remodel the scar tissue surrounding the nerve root.

Procedures for treating an Adherent Nerve Root:

| | |
|---|---|
| **FIL** | (Procedure 18) |
| **FISitt** | (Procedure 19) With increasing knee extension |
| **FIS** | (Procedure 20) |

- Always follow flexion procedures by extension in lying or extension in standing – to ensure that the flexion procedures do not provoke a posterior Derangement.

# NOTES FOR MODULE TEN

# MODULE TEN

## Quiz

1. What are the underlying causes for the development of the Dysfunction Syndrome?

2. List key history indicators that support the presence of the Dysfunction Syndrome.

3. Which of the following statements applies only to the Dysfunction Syndrome?

   b. Symptoms are worsened as a result of ten repeated movements to end range.
   c. Production of end range pain, not increasing on repetition.
   d. Pain in a neutral position.
   e. Increasing pain at end of range on repeated movements, no peripheralisation.

4. What is necessary for effective management of Dysfunction Syndrome?

5. Design a typical management programme for a patient with an Extension Dysfunction of the lumbar spine.

# MODULE TEN

## Quiz

1. Differential diagnosis of Adherent Nerve Root:

| | **DERANGEMENT**<br>Unilateral symptoms below the knee | **ADHERENT NERVE ROOT** |
|---|---|---|
| **FIS** | | |
| **FIL** | | |
| **EIS / EIL** | | |

2. List the key indicators from the history that support the presence of an Adherent Nerve Root.

3. What is necessary for the effective management of an Adherent Nerve Root?

4. Discuss what treatment progressions may be used in the management of an Adherent Nerve Root.

# MODULE ELEVEN

## MANAGEMENT OF POSTURAL SYNDROME

### Objectives

By participating fully in this module, a participant will be able to:

1. Describe and explain the management of the Postural Syndrome.

2. Explain the essential principles of self-management and of patient responsibility necessary to achieve optimal outcomes.

3. Design a typical management programme for a patient with Postural Syndrome which includes education on: the association between posture and pain, postural correction and the avoidance of aggravating postures.

# MODULE ELEVEN

## MANAGEMENT OF POSTURAL SYNDROME

**1. Describe and explain the management of Postural Syndrome**

- Education on link between posture and pain.
- Education on posture correction
  - How to attain proper posture
  - How to maintain proper posture
- Education on avoidance of aggravating posture.
- Patients should be warned that the adoption of new postures might cause the temporary development of 'new' pains, which will subside within a week.
- Management is thus a combination of avoidance and performance – avoid the aggravating factor, and perform the corrective procedures.

**2. Explain the essential principles of self–management and of patient responsibility necessary to achieve optimal outcomes.**

**Postural Syndrome – Aggravating Factor: Sitting**

- If a direct link between posture and pain can be clearly demonstrated to patients their compliance to the management programme is more rapidly achieved.

Correction of the sitting posture – explanation, demonstration, correction resulting in abolishing symptoms.

- That simple mechanical tension will eventually become painful is easily demonstrated to the patient using the analogy of the "bent finger", especially if the patient's own finger is used for educational purposes.
- Posture correction involves
  1. Attaining the correct sitting posture;
  2. Maintaining the correct posture when sitting for prolonged periods.
- To understand and attain the correct sitting posture the "slouch-overcorrect" procedure (procedure 13) is introduced. This procedure allows patients to feel the difference between a poor slouched posture, and a fully overcorrected posture. It is neither good nor desirable for patients to maintain this overcorrected position; prolonged excessive extension will eventually become as painful as prolonged flexion. The best sitting posture is gained by releasing the last 10% of the overcorrected sitting position. The lumbar lordosis should be similar when sitting to that which is present when standing.
- If the slouch-overcorrect procedure is practised three times daily, ten to fifteen times at each session, the patient will in a matter of a few weeks have re-educated their postural habit. They will no longer perceive the slouched posture as 'normal'; they will have come to find that the corrected posture is now 'normal' for them.
- As well as practising slouch-overcorrect in order to retrain their postural 'habit' and to train their muscles to hold their trunk upright, the procedure should be done regularly whenever pain arises. Ideally postures that produce pain should be avoided. Patients should be encouraged to monitor and correct their posture before the pain commences.

To maintain the correct sitting posture

- Lumbar lordosis can be maintained in two ways:
    1. Actively by muscular control when sitting on a seat and not using a backrest;
    2. Passively with the use of a lumbar roll or support, when sitting in a seat with a backrest.
- In postural retraining the problem lies in loss of awareness of the correct posture, not in an inability to assume it. Lumbar rolls, expensive office furniture, and ergonomically designed work stations will all have no effect on postural habits unless the individual is aware of the correct posture. Likewise strengthening of the muscles of the spine will have no effect on posture if the individual is not consciously aware of the correct sitting position. No strengthening exercise can teach the patient the correct sitting posture.

**Postural Syndrome – Aggravating Factor: Standing**

- Prolonged standing is another position in which low back pain of postural origin can occur.
- Two slouched standing positions are commonly observed
    - The patient may stand with an exaggerated lumbar lordosis and thoracic kyphosis and with the pelvis pushed forward, thus giving the appearance of a protruding abdomen. This posture involves end range extension.
    - The other standing posture commonly adopted is obtained by taking all the body weight on one leg, with the other knee bent, causing the pelvis to drop to one side. This involves end-range side gliding.

.

Correction of the standing posture

- The patient must be made aware of the link between their posture and their pain. It may well be necessary to provoke the pain by requiring them to remain standing until it appears. Once this happens postural correction will rapidly abolish symptoms.
- Lifting the chest and thoracic spine, tilting the pelvis slightly posteriorly, and gently tightening the abdominal muscles best achieve posture correction. The patient is then standing in a relaxed standing position rather than a slouched standing posture. Awareness of the position of the pelvis, and control of this angle is essential in attaining posture correction.

**Postural Syndrome – Aggravating Factor: Lying**

- Lying is another position in which low back pain of postural origin can occasionally occur. There will be a clear association between prolonged recumbency and the onset of pain.

- Such patients will be awakened by pain in the night or wake with pain in the morning which was not present prior to retiring the previous night. Such pain will abate soon after arising.
- If resting through the night is causing pain two factors need to be investigated
    1. The lying posture itself. This is different for each person and must be dealt with individually. Sleeping postures are habitual and can be difficult to influence.
        - Individuals may lie in a very flexed position if they sleep curled up, in the 'foetal position';
        - Or, if they lie with their legs straight out the lumbar spine may be in an extended position.
    2. The surface on which the person is lying. For the majority of people the mattress should not be too hard, whereas the base on which the mattress rests should be firm and unyielding. This gives adequate support without placing excessive stresses on the spine.
        - If the surface is too hard, due to the natural contours of the body, the lumbar spine may be without sufficient support.
        - If the bed is too soft or sags considerably, the sleeping posture may be one of extreme flexion. Usually the surface on which one is lying is easily corrected or modified.

Modification of the lying posture
- Use of lumbar support roll
- Firm up the mattress
- Soften the mattress

*Pain of postural origin arises from postural neglect; through postural correction patients can stop their pain and also prevent its onset*. As long as the link between pain and posture has been clearly demonstrated to patients, and they have been adequately educated most are well able to treat themselves.

When management by education is completed successfully, it should be explained to the patient that, although the present pain has been relieved, recurrence of similar symptoms is possible if postural care is neglected for extended periods. The consequences of postural neglect should be discussed.

Consequences of postural neglect
Long term postural neglect can lead to adaptive tissue shortening, causing Dysfunction Syndrome. Sustained flexion postures can also predispose patients to the development of a posterior Derangement.

**3. Design a typical management programme for a patient with Postural Syndrome, which includes education on: the association between posture and pain, posture correction and the avoidance of aggravating postures.**

Module Eleven Quiz activity

# NOTES FOR MODULE ELEVEN

# MODULE ELEVEN

## Quiz

1. List the key history indicators that support the presence of the Postural Syndrome.

*2.* Which of the following statements applies only to the Postural Syndrome?

   a. No deformity

   b. No referred pain

   c. Pain produced by posture or position

   d. No movement loss or pain with repeated end range movements

3. Which of the following statements is false for Postural Syndrome patients?

   a. Poor sitting posture

   b. No movement loss present

   c. Repeated movements No Effect

   d. Sustained postures No Effect

4. Design a typical management programme for a patient with the Postural Syndrome. Include education on the association between posture and pain, posture correction and the avoidance of aggravating postures.

# MODULE TWELVE

# FOLLOW UP EVALUATIONS

## Objectives

By participating fully in this module, a participant will be able to:

1. Describe the indicators used to establish changes in the patient's symptomatic and mechanical presentation.

2. Describe the review process used to confirm the patient's classification.

3. Assess and evaluate the response to the management provided, assess progress in view of the goals of management, and make appropriate modifications to ensure that the goals are achieved.

# MODULE TWELVE

## FOLLOW UP EVALUATIONS

### 1. Describe the indicators used to establish changes in the patients' symptomatic and mechanical presentation

- During the first assessment, data is gathered about the patient's pain and the impact that this is having on their function and normal activity.
- Baseline measures are collected on the symptomatic and mechanical presentations.
- On all subsequent occasions, clinicians must evaluate the effect of the management strategies being used against these baseline measures. This evaluation needs to address both the pain, which is frequently the patient's main complaint, and the impairment in function.
- Depending on the effect of the management strategies on the symptomatic and mechanical presentations these should be continued, abandoned or supplemented with force progressions, as appropriate.

**Symptomatic presentation**
The symptomatic presentation has various dimensions by which changes can be assessed.

Dimensions of symptomatic presentation to monitor progress
- Site of pain
- Constancy or intermittency
- Severity
- Paraesthesia
- Consumption of analgesics
- Pain on movement
- ADL activities

Criteria by which paraesthesia/ numbness may be improving
- Numbness may become more of a 'tingling' feeling
- The severity of the numbness may lessen
- The constancy of the paraesthesia/ numbness may lessen
- The area of paraesthesia/ numbness may diminish

**Mechanical presentation**

Dimensions of mechanical presentation by which to assess change
- Movement loss
- Deformity
- Deviation of movement
- Quality of movement
- Curve reversal
- Loss of normal function

Some commonly used back disability questionnaires

- Roland & Morris Disability Questionnaire – Roland & Morris 1983.
- The Oswestry Low Back Pain Disability Questionnaire - Fairbank et al 1980.
- Quebec Back Pain Disability Scale – Kopec et al 1995.

If the symptom response is unclear further testing may be necessary

- Test with provocative or potentially reductive procedures over two to three days
- Increase the number of repetitions
- Increase the frequency of repetitions
- Ensure that movements are to end-range
- Apply mechanical forces more vigorously (introduce clinician techniques)
- Sustain postures
- Use alternate starting positions
- Stress the joints in one direction and check the effects on pain and movement range in the opposite direction.

**2. Describe the review process used to confirm the patient's classification.**

**Review process**

- Conclusion made on day one is provisional
- Confirmation of the classification and the appropriateness of the chosen management strategy are made at follow up.
- If the response is still equivocal further testing may be necessary. Sometimes a period of three or four days may be necessary to confirm a directional preference or lack of it.
- Diagnostic classification should be complete within five sessions.
- On the second visit and at each subsequent visit a structured, logical and informative review process must be conducted to determine;
    - If the patient has been following the instructions given
    - The immediate effect of any procedures being done,
    - If there have been any overall changes.
- We need to know from the patient as a result of following instructions if there has been any change:

  "With the exercises and postural correction over the last day(s) overall is the patient better, worse, or the same?"

**3. Assess and evaluate the response to the management provided, assess progress in view of the goals of management, and make appropriate modifications to ensure that the goals are achieved.**

If Better

- No need to change management in any way, and they should continue with more of the same.
- The patient should be questioned and examined thoroughly, as outlined earlier, to ensure that they are actually 'better' than the previous visit.

- If their response is definitely improved, and supported by symptom location change or symptom abolition and mechanical improvement, the classification is confirmed and the appropriate management strategy has been selected.

If worse or unchanged

- They must be questioned more closely about what they have been doing:
- In regards to their exercise:
    - How frequently have they been exercising?
    - How many repetitions?
    - What exercise have they been doing? Get them to show you; however clear you think you may have been, unfortunately patients frequently 'adapt' the exercise.
    - Is their technique correct?
    - What is the symptom response when they do the exercise?
    - Have they understood the reasons for the exercises?

In regards to their posture:

- Have they been correcting their posture?
- What is the symptomatic response with posture correction?
- Have they understood the reasons for posture correction?

Then proceed to:

- Check symptomatic presentation fully.
- If there is a change, is this definite or doubtful?
- Check symptom site for centralisation, frequency (constant or intermittent; if intermittent, what proportion of the day), and severity?
- Check if there has been any change in functional problems.
- Check mechanical presentation fully – range of movement, pain on movement, deformity.

If worse

- The treatment principle or starting position may need to be changed, or the procedure may need to be slowed down.
- Alternatively one of the 'other' classifications may need to be considered.

If unchanged

- Is the patient exercising regularly enough and doing the right exercise?
- If they have been, force progression may be necessary, or if this has been attempted already, an alternative treatment principle should be considered.
- Was it expected, e.g. in dysfunction?

From the review

- Better – This gives a 'green light' for continuing the treatment principle
- Worse – This gives a 'red light'
- Unchanged – This gives an 'amber light'

# NOTES PAGE FOR MODULE TWELVE

# MODULE TWELVE

## Quiz

1. On re-assessment your patient states that he/she is worse or unchanged. What questions do you ask next?

2. When re-assessing your patient, what are indicators of improvement? *(3 factors)*

3. Which patients would you expect to be rapid responders, which would be slow responders, which would be non-responders?

4. Describe two outcome predictors specific to the McKenzie Method

5. In the case study provided what is your prognosis for this patient - Support your answer.

# MODULE THIRTEEN

## RECURRENCES AND PROPHYLAXIS

### Objectives

By participating fully in this module, a participant will be able to:

1. Identify those factors which predispose patients to a recurrence of low back pain.

2. Explain the prophylactic concept.

3. Discuss the role of self-management and patient responsibility in effective prophylaxis.

4. Design a specific prophylactic programme for each of the three McKenzie syndromes.

# MODULE THIRTEEN

## RECURRENCES AND PROPHYLAXIS

**1. Identify those factors, which predispose patients to a recurrence of low back pain.**

- The strongest known risk factor for future back pain is a history of past back pain
- Heavy or frequent lifting
- Whole body vibration
- Prolonged or frequent bending or twisting
- Postural stresses
- Psychological factors

**2. Explain the prophylactic concept.**

Goals of secondary prevention in musculoskeletal problems

- To prevent or decrease the number of new episodes
- Shorten the duration of future episodes
- Enhance self-management strategies
- Decrease the need for health-care seeking
- Decrease the need for time off work

Achieved through

- Provision of education
- Encouragement of patients to 'problem solve' their own difficulties
- Nurturing of self-management strategies to address the recurrent and episodic nature of back pain.

All this should be done from day one and those strategies will need to be individualised according to the patient.

**The patients' perspective:**

Four key issues identified

- The problem itself
- How they can self-manage
- About tests, diagnosis and interventions
- About prognosis

**3. Discuss the role of self-management and patient responsibility in effective prophylaxis.**

Key points for patients in prophylaxis:

- The fitter, more active and more posturally aware you are the less likely you are to have pain, and the better you will cope with it if it returns.
- Keep on top of your back problem by exercising regularly.
- When you start to increase your fitness do so in a gradual way. Start with an easy level of exercise for you and do more as you feel able to.
- Remember the importance of posture in looking after your back.
- Remember the importance of frequent changes of activity, and limiting the time you remain in one position.
- Compensate for periods of prolonged stooping or sitting by standing erect and bending backwards a number of times.
- If the pain returns use the same exercises that helped during the current episode.
- If within a few days of commencing the exercises improvement has not occurred seek further advice.

**4. Design a specific prophylactic programme for each of the three McKenzie syndromes.**

Module Thirteen Quiz activity

# NOTES PAGE MODULE THIRTEEN

# MODULE THIRTEEN

## Quiz

1. Describe the key features of a prophylactic programme.

2. Design a specific prophylactic programme required for each of the three McKenzie syndromes.

3. For the case study provided design an appropriate prophylactic programme.

# APPENDIX 1:

# CASE STUDY

# APPENDIX 1

## CASE STUDY

### History

A forty-five year old man is referred by his GP; he is a computer technician, with a job that involves some driving and sitting, but is also reasonably varied and active. He scores 12 out of 24 items on the Roland and Morris disability questionnaire and indicates his pain at six on a 0-10 visual analogue scale. He is not off work with the present episode. He has stopped his usual sporting activities because of back pain; these are running and climbing, but he is keen to resume them again. On the last occasion he tried to run his leg pain was severely exacerbated for several days.

His symptoms have been present for about three months, they came on for no apparent reason, and are now unchanging. They consist of aching that radiates from his back and left buttock all the way down the back of his thigh and leg to his ankle. Sometimes he has noted pins and needles in the outer border of his foot.

Symptoms commenced in his back, and spread into his leg after several weeks. The intensity of the pain is the same in the back and leg. In the back, symptoms are constant, but in the limb they are intermittent. He estimates that he feels the ache in the thigh about 80% of each day and in the leg about 50% of each day. The pins and needles in his foot are less frequent, but do occur every day, when the pain is at its worst.

He reports that his symptoms are made worse and in time peripheralise by bending, sitting, driving and as the day progresses. Standing and walking for extended periods also aggravated his symptoms. He prefers being on the move, his symptoms are also better when he lies down and in the morning. His sleep is not disturbed.

He relates that he has had several previous episodes of back pain over the last ten years, but no leg pain before. Previous episodes have lasted a few weeks and then spontaneously resolved; with more recent episodes tending to be longer in duration. He has not sought treatment before.

He reports no disturbance of bladder function, no altered gait, but sometimes increased buttock pain on coughing and sneezing. He has not had x-rays, has had no surgery, nor been involved in any accidents, and his weight is stable. He reports his general health is excellent with no ongoing medical conditions.

He sometimes takes analgesics, up to about four a day, these dull the pain temporarily, but as they are rather ineffective he only uses them a few days a week. When he first saw the GP he took a course of anti-inflammatory tablets, but their effect was also negligible.

### Physical Examination

He sits slouched on the treatment couch and reports that his pain has peripheralised into his thigh during the interview. On attempting posture correction the thigh pain is increased. He stands with a flattened lumbar spine and without a lateral shift.

His pain status in standing is back and thigh pain, with no symptoms in his leg. He displays a moderate loss of flexion, reaching to his upper shin, which increases his thigh pain. Normally he can reach his feet on forward flexion. He also displays a major loss of extension, which produces calf pain after one movement that abates after a few minutes – this movement is not tested further. Side gliding is asymmetrical; with nil loss of right side gliding, but a major loss of left side gliding.

A neurological examination is conducted. Resistance testing of his calf muscles, extensor hallucis longus and dorsiflexors are the same on both sides, and there is no apparent loss of sensation around the lateral border of his foot, big toe or medial part of his leg.

His pain status in lying is back and thigh pain again. Extension in lying produces calf pain after several repetitions and so again he is stopped from performing further movements.

The patient's hips are shifted to the right, as he lies prone on the plinth, so that he lies in a position of left lateral bending. The therapist stabilises his hips in the off centre position while the patient performs extension in lying. During repeated movements of this kind he reports a lessening of symptoms in the thigh. After two sets of ten repeated movements he reports that the pain is no longer to his knee, but now just below his buttock. When he stands after performing two more sets of repetitions he reports only left sided and central back pain.

## Session Two

He is not able to return for two days. When he returns he is asked, 'as a result of what you have been asked to do, are you better, worse, or the same?' He reports he is better, and is questioned about the five possible dimensions of improvement:

- Has pain location changed?
- Has pain frequency changed?
- Has pain intensity changed?
- Is there more movement for less pain?
- Has function improved?

He reports that he has had neither calf pain nor pins and needles since the initial consultation. The thigh pain is mostly now in the top of his thigh and is present much less frequently. The back pain is still constant, and is slightly more noticeable. Movement is easier and certain activities, that were painful, cause less or no pain now. He reports that he has performed the extension in lying with hips off centre movement regularly, at least every two hours. Every time he performs the procedure any symptoms present in his thigh are abolished, and symptoms in his buttock is reduced. Overall he rates himself at least 50% better already, very satisfied with progress, and continuing to improve.

On checking his mechanical presentation extension displays a minimum loss and there is now only a minor loss of left side gliding. His technique is checked and he is performing the procedure correctly.

He is not able to attend for five days, but is encouraged to continue with the present management as long as it produces the same response.

## Session Three

He is pleased upon his return, but also feels that no further improvement has occurred in the last two days. In that time he has only experienced an ache in the back, which is present about 50% of the day. There have been no symptoms in his thigh or lower leg in the last forty-eight hours. The exercise has little effect on the remaining back pain. He has not felt any need to take tablets at all since starting treatment.

On further questioning he reports that back pain returns mostly when he is sitting or driving. He is generally free of symptoms when walking about. He reports some back pain as he sits in the clinic. This is abolished with posture correction. His range of flexion has now returned to normal, his side gliding movements are equal right and left. He has a minor limitation of extension that produces his back pain. Repeated extension in standing begins to increase the back pain, which goes when he stops the movement. Extension in lying also produces back pain, but this is reduced and then abolished on repetition. Afterwards extension in standing is pain free and full.

## Session Four

He has had virtually no symptoms at all in the last few days. Occasionally, if he sits poorly symptoms return, but he is rapidly able to abolish these with a change in position. Extension in lying has either been pain free and full, or if pain is present on first performing the exercise it is soon abolished. He has been for a two-mile jog at a gentle pace with no ill effect. He indicates no functional loss on the Roland and Morris disability questionnaire (Roland & Morris 1983), and between nought and one on the visual analogue scale. All his movements are examined; there is no loss and no discomfort. He is considered to have made a full recovery, and he is encouraged to make a gradual increase in his sporting activity. The issue of relapse and the use of the same exercises, as long as they generate the same response, and the importance of general fitness, are discussed. He is happy to be discharged.

# APPENDIX 2:

# ASSESSMENT FORMS

# THE McKENZIE INSTITUTE
# LUMBAR SPINE ASSESSMENT

Date _____

Name _____ Sex M / F

Address _____

Telephone _____

Date of Birth _____ Age _____

Referral: *GP / Orth / Self / Other* _____

Work: Mechanical stresses _____

_____

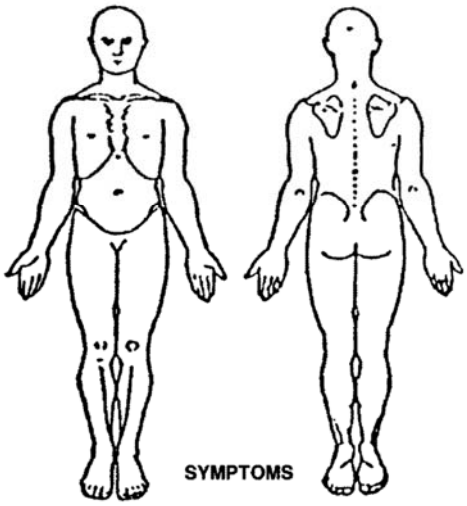
Leisure: Mechanical stresses _____

Functional disability from present episode _____

_____

Functional disability score _____

VAS Score (0-10) _____




## HISTORY

Present symptoms _____

Present since _____ *improving / unchanging / worsening*

Commenced as a result of _____ *or no apparent reason*

Symptoms at onset: *back / thigh / leg* _____

Constant symptoms: *back / thigh / leg* _____ Intermittent symptoms: *back / thigh / leg*

Worse *bending* *sitting / rising* *standing* *walking* *lying*

*am / as the day progresses / pm* *when still / on the move*

*other* _____

Better *bending* *sitting* *standing* *walking* *lying*

*am / as the day progresses / pm* *when still / on the move*

*other* _____

Disturbed sleep *yes / no* Sleeping postures: *prone / sup / side R / L* Surface: *firm / soft / sag*

Previous episodes 0 1-5 6-10 11+ Year of first episode _____

Previous history _____

_____

Previous treatments _____

_____

## SPECIFIC QUESTIONS

*Cough / sneeze / strain / +ve / -ve* Bladder/Bowel: *normal / abnormal* Gait: *normal / abnormal*

Medications: *Nil / NSAIDS / Analg / Steroids / Anticoag / Other* _____

General health: *good / fair / poor* _____

Imaging: *yes / no* _____

Recent or major surgery: *yes / no* _____ Night pain: *yes / no* _____

Accidents: *yes / no* _____ Unexplained weight loss: *yes / no*

Other: _____

_____

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## EXAMINATION

**POSTURAL OBSERVATION**

Sitting: *good / fair / poor* Standing: *good / fair / poor* Lordosis: *red / acc / normal* Lateral shift: *right / left / nil*

Correction of posture: *better / worse / no effect* _____ Relevant: *yes / no*

Other observations: _____

**NEUROLOGICAL**

Motor deficit _____ Reflexes _____

Sensory deficit _____ Dural signs _____

**MOVEMENT LOSS**

| | Maj | Mod | Min | Nil | Pain |
|---|---|---|---|---|---|
| Flexion | | | | | |
| Extension | | | | | |
| Side gliding R | | | | | |
| Side gliding L | | | | | |

**TEST MOVEMENTS** **Describe effect on present pain – During:** produces, abolishes, increases, decreases, no effect, centralising, peripheralising. **After:** better, worse, no better, no worse, no effect, centralised, peripheralised.

| | Symptoms during testing | Symptoms after testing | Mechanical response ↑Rom | ↓Rom | No effect |
|---|---|---|---|---|---|
| **Pretest symptoms standing** | | | | | |
| FIS | | | | | |
| Rep FIS | | | | | |
| EIS | | | | | |
| Rep EIS | | | | | |
| **Pretest symptoms lying** | | | | | |
| FIL | | | | | |
| Rep FIL | | | | | |
| EIL | | | | | |
| Rep EIL | | | | | |
| **If required pretest symptoms** | | | | | |
| SGIS - R | | | | | |
| Rep SGIS - R | | | | | |
| SGIS - L | | | | | |
| Rep SGIS - L | | | | | |

**STATIC TESTS**

Sitting slouched _____ Sitting erect _____

Standing slouched _____ Standing erect _____

Lying prone in extension _____ Long sitting _____

**OTHER TESTS** _____

_____

**PROVISIONAL CLASSIFICATION**

| Derangement | Dysfunction | Postural | OTHER |
|---|---|---|---|
| Central or Symmetrical | Unilateral or Asymmetrical above knee | Unilateral or Asymmetrical below knee | |

**PRINCIPLE OF MANAGEMENT**

Education _____ Equipment provided _____

Extension principle _____ Lateral principle _____

Flexion principle _____ Other _____

Barriers to recovery _____

Treatment goal _____

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# THE McKENZIE INSTITUTE
# LUMBAR SPINE ASSESSMENT

Date _____

Name _____ Sex M / F

Address _____

Telephone _____

Date of Birth _____ Age _____

Referral: *GP / Orth / Self / Other* _____

Work: Mechanical stresses _____

_____

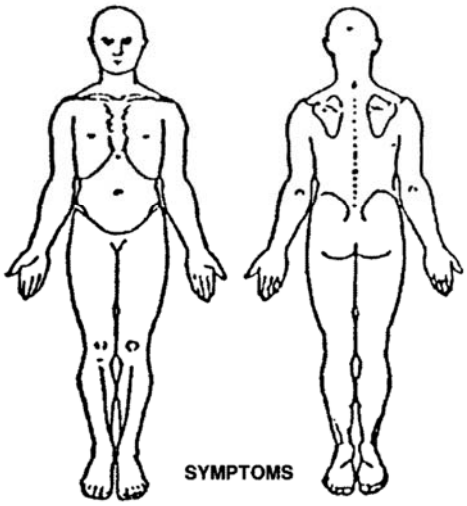
Leisure: Mechanical stresses _____

Functional disability from present episode _____

_____

Functional disability score _____

VAS Score (0-10) _____




## HISTORY

Present symptoms _____

Present since _____ *improving / unchanging / worsening*

Commenced as a result of _____ *or no apparent reason*

Symptoms at onset: *back / thigh / leg* _____

Constant symptoms: *back / thigh / leg* _____ Intermittent symptoms: *back / thigh / leg*

Worse *bending sitting / rising standing walking lying*

*am / as the day progresses / pm when still / on the move*

*other* _____

Better *bending sitting standing walking lying*

*am / as the day progresses / pm when still / on the move*

*other* _____

Disturbed sleep *yes / no* Sleeping postures: *prone / sup / side R / L* Surface: *firm / soft / sag*

Previous episodes 0 1-5 6-10 11+ Year of first episode _____

Previous history _____

_____

Previous treatments _____

_____

## SPECIFIC QUESTIONS

*Cough / sneeze / strain / +ve / -ve* Bladder/Bowel: *normal / abnormal* Gait: *normal / abnormal*

Medications: *Nil / NSAIDS / Analg / Steroids / Anticoag / Other* _____

General health: *good / fair / poor* _____

Imaging: *yes / no* _____

Recent or major surgery: *yes / no* _____ Night pain: *yes / no* _____

Accidents: *yes / no* _____ Unexplained weight loss: *yes / no*

Other: _____

_____

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## EXAMINATION

### POSTURAL OBSERVATION

Sitting: *good / fair / poor* Standing: *good / fair / poor* Lordosis: *red / acc / normal* Lateral shift: *right / left / nil*

Correction of posture: *better / worse / no effect* _____ Relevant: *yes / no*

Other observations: _____

### NEUROLOGICAL

Motor deficit _____ Reflexes _____

Sensory deficit _____ Dural signs _____

### MOVEMENT LOSS

| | Maj | Mod | Min | Nil | Pain |
|---|---|---|---|---|---|
| Flexion | | | | | |
| Extension | | | | | |
| Side gliding R | | | | | |
| Side gliding L | | | | | |

### TEST MOVEMENTS

**Describe effect on present pain – During:** produces, abolishes, increases, decreases, no effect, centralising, peripheralising. **After:** better, worse, no better, no worse, no effect, centralised, peripheralised.

| | Symptoms during testing | Symptoms after testing | Mechanical response ↑Rom | ↓Rom | No effect |
|---|---|---|---|---|---|
| **Pretest symptoms standing** | | | | | |
| FIS | | | | | |
| Rep FIS | | | | | |
| EIS | | | | | |
| Rep EIS | | | | | |
| **Pretest symptoms lying** | | | | | |
| FIL | | | | | |
| Rep FIL | | | | | |
| EIL | | | | | |
| Rep EIL | | | | | |
| **If required pretest symptoms** | | | | | |
| SGIS - R | | | | | |
| Rep SGIS - R | | | | | |
| SGIS - L | | | | | |
| Rep SGIS - L | | | | | |

### STATIC TESTS

Sitting slouched _____ Sitting erect _____

Standing slouched _____ Standing erect _____

Lying prone in extension _____ Long sitting _____

### OTHER TESTS

_____

_____

### PROVISIONAL CLASSIFICATION

| Derangement | Dysfunction | Postural | OTHER |
|---|---|---|---|
| Central or Symmetrical | Unilateral or Asymmetrical above knee | Unilateral or Asymmetrical below knee | |

### PRINCIPLE OF MANAGEMENT

Education _____ Equipment provided _____

Extension principle _____ Lateral principle _____

Flexion principle _____ Other _____

Barriers to recovery _____

Treatment goal _____

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# THE McKENZIE INSTITUTE
# LUMBAR SPINE ASSESSMENT

Date _____

Name _____ Sex M / F

Address _____

Telephone _____

Date of Birth _____ Age _____

Referral: *GP / Orth / Self / Other* _____

Work: Mechanical stresses _____

_____

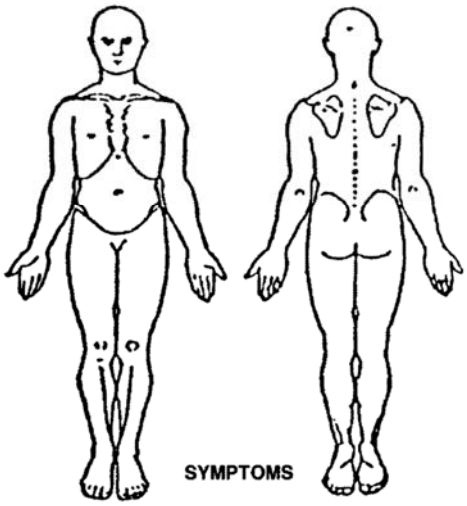
Leisure: Mechanical stresses _____

Functional disability from present episode _____

_____

Functional disability score _____

VAS Score (0-10) _____




## HISTORY

Present symptoms _____

Present since _____ *improving / unchanging / worsening*

Commenced as a result of _____ *or no apparent reason*

Symptoms at onset: *back / thigh / leg* _____

Constant symptoms: *back / thigh / leg* _____ Intermittent symptoms: *back / thigh / leg*

Worse *bending sitting / rising standing walking lying*

*am / as the day progresses / pm when still / on the move*

*other* _____

Better *bending sitting standing walking lying*

*am / as the day progresses / pm when still / on the move*

*other* _____

Disturbed sleep *yes / no* Sleeping postures: *prone / sup / side R / L* Surface: *firm / soft / sag*

Previous episodes 0 1-5 6-10 11+ Year of first episode _____

Previous history _____

_____

Previous treatments _____

_____

## SPECIFIC QUESTIONS

*Cough / sneeze / strain / +ve / -ve* Bladder/Bowel: *normal / abnormal* Gait: *normal / abnormal*

Medications: *Nil / NSAIDS / Analg / Steroids / Anticoag / Other* _____

General health: *good / fair / poor* _____

Imaging: *yes / no* _____

Recent or major surgery: *yes / no* _____ Night pain: *yes / no* _____

Accidents: *yes / no* _____ Unexplained weight loss: *yes / no*

Other: _____

_____

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## EXAMINATION

### POSTURAL OBSERVATION

Sitting: *good / fair / poor* Standing: *good / fair / poor* Lordosis: *red / acc / normal* Lateral shift: *right / left / nil*

Correction of posture: *better / worse / no effect* _____ Relevant: *yes / no*

Other observations: _____

### NEUROLOGICAL

Motor deficit _____ Reflexes _____

Sensory deficit _____ Dural signs _____

### MOVEMENT LOSS

| | Maj | Mod | Min | Nil | Pain |
|---|---|---|---|---|---|
| Flexion | | | | | |
| Extension | | | | | |
| Side gliding R | | | | | |
| Side gliding L | | | | | |

### TEST MOVEMENTS

**Describe effect on present pain – During:** produces, abolishes, increases, decreases, no effect, centralising, peripheralising. **After:** better, worse, no better, no worse, no effect, centralised, peripheralised.

| | Symptoms during testing | Symptoms after testing | Mechanical response ↑Rom | ↓Rom | No effect |
|---|---|---|---|---|---|
| **Pretest symptoms standing** | | | | | |
| FIS | | | | | |
| Rep FIS | | | | | |
| EIS | | | | | |
| Rep EIS | | | | | |
| **Pretest symptoms lying** | | | | | |
| FIL | | | | | |
| Rep FIL | | | | | |
| EIL | | | | | |
| Rep EIL | | | | | |
| **If required pretest symptoms** | | | | | |
| SGIS - R | | | | | |
| Rep SGIS - R | | | | | |
| SGIS - L | | | | | |
| Rep SGIS - L | | | | | |

### STATIC TESTS

Sitting slouched _____ Sitting erect _____

Standing slouched _____ Standing erect _____

Lying prone in extension _____ Long sitting _____

### OTHER TESTS

_____

_____

### PROVISIONAL CLASSIFICATION

| Derangement | Dysfunction | Postural | OTHER |
|---|---|---|---|
| Central or Symmetrical | Unilateral or Asymmetrical above knee | Unilateral or Asymmetrical below knee | |

### PRINCIPLE OF MANAGEMENT

Education _____ Equipment provided _____

Extension principle _____ Lateral principle _____

Flexion principle _____ Other _____

Barriers to recovery _____

Treatment goal _____

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# THE McKENZIE INSTITUTE
# LUMBAR SPINE ASSESSMENT

Date _____

Name _____ Sex M / F

Address _____

Telephone _____

Date of Birth _____ Age _____

Referral: *GP / Orth / Self / Other* _____

Work: Mechanical stresses _____

_____

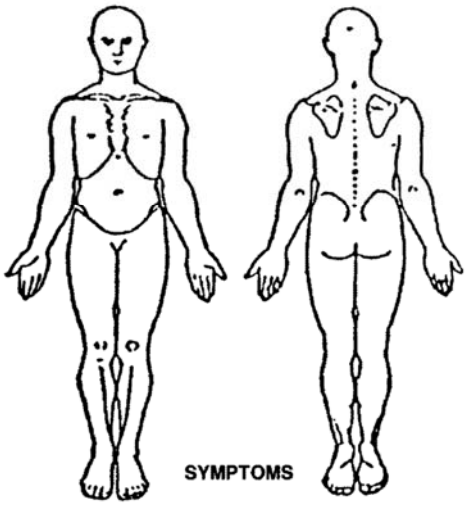
Leisure: Mechanical stresses _____

Functional disability from present episode _____

_____

Functional disability score _____

VAS Score (0-10) _____




## HISTORY

Present symptoms _____

Present since _____ *improving / unchanging / worsening*

Commenced as a result of _____ *or no apparent reason*

Symptoms at onset: *back / thigh / leg* _____

Constant symptoms: *back / thigh / leg* _____ Intermittent symptoms: *back / thigh / leg*

Worse *bending* *sitting / rising* *standing* *walking* *lying*

*am / as the day progresses / pm* *when still / on the move*

*other* _____

Better *bending* *sitting* *standing* *walking* *lying*

*am / as the day progresses / pm* *when still / on the move*

*other* _____

Disturbed sleep *yes / no* Sleeping postures: *prone / sup / side R / L* Surface: *firm / soft / sag*

Previous episodes 0 1-5 6-10 11+ Year of first episode _____

Previous history _____

_____

Previous treatments _____

_____

## SPECIFIC QUESTIONS

*Cough / sneeze / strain / +ve / -ve* Bladder/Bowel: *normal / abnormal* Gait: *normal / abnormal*

Medications: *Nil / NSAIDS / Analg / Steroids / Anticoag / Other* _____

General health: *good / fair / poor* _____

Imaging: *yes / no* _____

Recent or major surgery: *yes / no* _____ Night pain: *yes / no* _____

Accidents: *yes / no* _____ Unexplained weight loss: *yes / no*

Other: _____

_____

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## EXAMINATION

### POSTURAL OBSERVATION

Sitting: *good / fair / poor* Standing: *good / fair / poor* Lordosis: *red / acc / normal* Lateral shift: *right / left / nil*

Correction of posture: *better / worse / no effect* _____ Relevant: *yes / no*

Other observations: _____

### NEUROLOGICAL

Motor deficit _____ Reflexes _____

Sensory deficit _____ Dural signs _____

### MOVEMENT LOSS

| | Maj | Mod | Min | Nil | Pain |
|---|---|---|---|---|---|
| Flexion | | | | | |
| Extension | | | | | |
| Side gliding R | | | | | |
| Side gliding L | | | | | |

### TEST MOVEMENTS

**Describe effect on present pain – During:** produces, abolishes, increases, decreases, no effect, centralising, peripheralising. **After:** better, worse, no better, no worse, no effect, centralised, peripheralised.

| | Symptoms during testing | Symptoms after testing | Mechanical response ↑Rom | ↓Rom | No effect |
|---|---|---|---|---|---|
| **Pretest symptoms standing** | | | | | |
| FIS | | | | | |
| Rep FIS | | | | | |
| EIS | | | | | |
| Rep EIS | | | | | |
| **Pretest symptoms lying** | | | | | |
| FIL | | | | | |
| Rep FIL | | | | | |
| EIL | | | | | |
| Rep EIL | | | | | |
| **If required pretest symptoms** | | | | | |
| SGIS - R | | | | | |
| Rep SGIS - R | | | | | |
| SGIS - L | | | | | |
| Rep SGIS - L | | | | | |

### STATIC TESTS

Sitting slouched _____ Sitting erect _____

Standing slouched _____ Standing erect _____

Lying prone in extension _____ Long sitting _____

### OTHER TESTS

_____

_____

### PROVISIONAL CLASSIFICATION

| Derangement | Dysfunction | Postural | OTHER |
|---|---|---|---|
| Central or Symmetrical | Unilateral or Asymmetrical above knee | Unilateral or Asymmetrical below knee | |

### PRINCIPLE OF MANAGEMENT

Education _____ Equipment provided _____

Extension principle _____ Lateral principle _____

Flexion principle _____ Other _____

Barriers to recovery _____

Treatment goal _____

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# THE McKENZIE INSTITUTE
# LUMBAR SPINE ASSESSMENT

Date _____

Name _____ Sex M / F

Address _____

Telephone _____

Date of Birth _____ Age _____

Referral: *GP / Orth / Self / Other* _____

Work: Mechanical stresses _____

_____

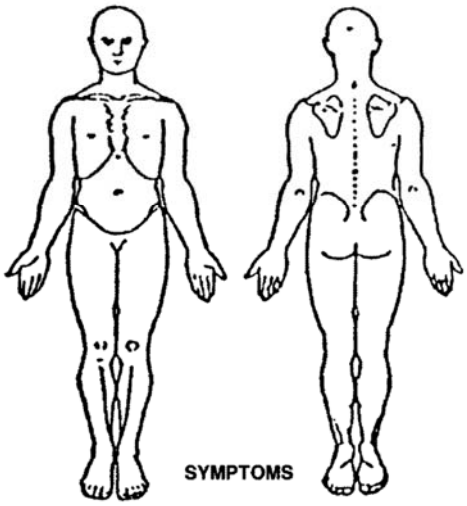
Leisure: Mechanical stresses _____

Functional disability from present episode _____

_____

Functional disability score _____

VAS Score (0-10) _____




## HISTORY

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Worse *bending* *sitting / rising* *standing* *walking* *lying*

*am / as the day progresses / pm* *when still / on the move*

*other* _____

Better *bending* *sitting* *standing* *walking* *lying*

*am / as the day progresses / pm* *when still / on the move*

*other* _____

Disturbed sleep *yes / no* Sleeping postures: *prone / sup / side R / L* Surface: *firm / soft / sag*

Previous episodes 0 1-5 6-10 11+ Year of first episode _____

Previous history _____

_____

Previous treatments _____

_____

## SPECIFIC QUESTIONS

*Cough / sneeze / strain / +ve / -ve* Bladder/Bowel: *normal / abnormal* Gait: *normal / abnormal*

Medications: *Nil / NSAIDS / Analg / Steroids / Anticoag / Other* _____

General health: *good / fair / poor* _____

Imaging: *yes / no* _____

Recent or major surgery: *yes / no* _____ Night pain: *yes / no* _____

Accidents: *yes / no* _____ Unexplained weight loss: *yes / no*

Other: _____

_____

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## EXAMINATION

### POSTURAL OBSERVATION

Sitting: *good / fair / poor* Standing: *good / fair / poor* Lordosis: *red / acc / normal* Lateral shift: *right / left / nil*

Correction of posture: *better / worse / no effect* _____ Relevant: *yes / no*

Other observations: _____

### NEUROLOGICAL

Motor deficit _____ Reflexes _____

Sensory deficit _____ Dural signs _____

### MOVEMENT LOSS

| | Maj | Mod | Min | Nil | Pain |
|---|---|---|---|---|---|
| Flexion | | | | | |
| Extension | | | | | |
| Side gliding R | | | | | |
| Side gliding L | | | | | |

### TEST MOVEMENTS

**Describe effect on present pain – During:** produces, abolishes, increases, decreases, no effect, centralising, peripheralising. **After:** better, worse, no better, no worse, no effect, centralised, peripheralised.

| | Symptoms during testing | Symptoms after testing | Mechanical response ↑Rom | ↓Rom | No effect |
|---|---|---|---|---|---|
| **Pretest symptoms standing** | | | | | |
| FIS | | | | | |
| Rep FIS | | | | | |
| EIS | | | | | |
| Rep EIS | | | | | |
| **Pretest symptoms lying** | | | | | |
| FIL | | | | | |
| Rep FIL | | | | | |
| EIL | | | | | |
| Rep EIL | | | | | |
| **If required pretest symptoms** | | | | | |
| SGIS - R | | | | | |
| Rep SGIS - R | | | | | |
| SGIS - L | | | | | |
| Rep SGIS - L | | | | | |

### STATIC TESTS

Sitting slouched _____ Sitting erect _____

Standing slouched _____ Standing erect _____

Lying prone in extension _____ Long sitting _____

### OTHER TESTS

_____

_____

### PROVISIONAL CLASSIFICATION

| Derangement | Dysfunction | Postural | OTHER |
|---|---|---|---|
| Central or Symmetrical | Unilateral or Asymmetrical above knee | Unilateral or Asymmetrical below knee | |

### PRINCIPLE OF MANAGEMENT

Education _____ Equipment provided _____

Extension principle _____ Lateral principle _____

Flexion principle _____ Other _____

Barriers to recovery _____

Treatment goal _____

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# MCKENZIE INSTITUTE ASSESSMENT FORMS

## *Guidelines for the Completion of the Spinal Assessment Forms*

| **History**: **Page One**<br>***Patient responses are recorded but supplemented by the clinician as appropriate*** | |
|---|---|
| **Referral:** | Circle the appropriate, may record date of follow-up appointment. |
| **Postures / Stresses:** | **Work: Mechanical stresses**:<br>Record work activities and indicate frequency of activity e.g. 50% sitting, 50% standing.<br>**Leisure: Mechanical stresses:**<br>Record leisure or hobby activities and indicate frequency of activity e.g.; 75% sitting, 25% bending or could say walking 3 x week 40 mins, gardening 3 hours/week for example. |
| **Functional Disability from Present Episode:** | Ask patient to identify specific activities that they are unable to perform or have difficulty performing because of their current symptoms. |
| **Functional Disability Score:** | Record the test being used, and the score. |
| **VAS Score:** | Ask the patient to scale the intensity of their pain, include the intensity of the most distal. Can use a pain range, or use the average intensity of pain. |
| **Body Chart:** | Used to record “all symptoms this episode” i.e. all the symptoms the patient has experienced this episode. All symptoms may not still be present. |
| **Present Symptoms:** | Record the location/type of symptoms that are still concerning the patient. This may differ from the body chart as not all may still be present. |
| **Present Since:** | Usually given in weeks or days. Can write a specific date if known or if needed for legal reasons. |
| **Improving / Unchanging / Worsening:** | Circle as appropriate, and ask patient how, or in what way their symptoms are improving or worsening. |
| **Commenced as a Result of:** | If appropriate describe mechanism of injury e.g. lifting and twisting Or circle no apparent reason. |
| **Symptoms at Onset:** | Circle the time frame of onset of initial pain e.g. circle “back”, then record onset of other symptoms. |
| **Constant / Intermittent:** | Circle as appropriate. Back = to gluteal fold, Thigh = above knee, Leg = below knee, Neck = to tip of shoulder, Arm = shoulder to elbow, Forearm = forearm to hand. |

| **History**: **Page One**<br>***Patient responses are recorded but supplemented by the clinician as appropriate*** | |
|---|---|
| **Better / Worse Section:** | Recording<br>*Circle* for always – if not clarified this means immediate pain response. If relates to time need to clarify outside the circle with e.g. 10minutes, prolonged. *Line under* – sometimes. *Oblique line through* – no effect.<br>Put a ? above activity if patient still unsure even after further questions, rather than leave blank.<br>If patient presents with two unrelated areas of symptoms, indicate which activities affect which symptom. |
| **Disturbed Sleep:** | If always circle Yes, sometimes underline Yes. Not affected circle No. If was previously circle Yes but write "previously". |
| **Sleeping Postures:** | Circle usual, indicate if unable to use this because of current pain and indicate present position – best and worse. |
| **Sleeping Surface:** | Circle as appropriate. |
| **Previous Episodes:** | Circle 0, between 1-5 episodes, 6-10 episodes or 11+, indicate year of first episode |
| **Previous History:** | Write if episodic, document previous location of symptoms, length of previous episodes, severity of episodes, and if symptom free between episodes. |
| **Previous Treatment:** | Record what treatments they have had for this episode and, if appropriate, what treatments they have had for previous episodes. Indicate what has helped previously. |
| **Specific Questions:** | Circle appropriate answers and write any clarifications on the lines provided. |

| **Physical Examination: Page Two** | |
|---|---|
| It is not essential to perform all components of the Physical examination with every patient. If any section is not performed an oblique line is drawn through it. | |
| **Postural Observation:** | Circle appropriate response. |
| **Correction of Posture:** | Circle response and indicate which pain changes if appropriate. |
| **Other Observations:** | Record any significant musculo-skeletal differences, e.g. wasting, swelling redness etc. |
| **Neurological Examination:** | Qualify which deficit in each section, recorded if abnormal, e.g. decreased S1 reflex. Can add Babinski / Clonus to reflexes if required.<br>Record as "normal" if testing was normal. Oblique line through if not applicable |

| **Physical Examination: Page Two** | |
|---|---|
| **Movement Loss:** | The boxes Maj/Mod/Min/Nil can be used as a line i.e. more as a continuum. Can also record as a tick in the "pain" box, if patient is reporting pain, indicate location of the pain. |
| **Test Movements:** | If the order of the test movement is performed differently to that on the form, number the order. Useful also to record the number of repetitions performed to produce a response.<br>**Symptomatic response** - Use standard terms only. Monitor and describe effect on all symptoms, especially the most distal.<br>**Mechanical response** – Tick appropriate box. Can indicate which movement has been affected by the change if it is different to the one being tested. |
| **Static Tests:** | Record with standard "After" words. |
| **Other Tests:** | State which and the response achieved. |
| **Provisional Classification:** | Circle the classification. For Derangement, record the pain location and the Directional Preference. For Dysfunction, record the direction. For OTHER, record the sub-group. |
| **Principle of Management:** | **Education** - Record specifics, e.g. posture correction, avoidance of flexion.<br>**Extension Principle, Flexion Principle or Lateral Principle** - Document the specific exercises provided to the patient.<br>**Barriers to Recovery** – Record potential barriers identified.<br>**Treatment Goals** – Indicate what you expect to change by next visit and things you wish to reassess on Day 2. Short and Long term goals can be recorded also. |

# APPENDIX 3:

# CLASSIFICATION AND OPERATIONAL DEFINITIONS

# APPENDIX THREE

## CLASSIFICATION, OPERATIONAL DEFINITIONS AND DEFINITION OF TERMS

### CLASSIFICATION:

| CATEGORY | DEFINITIONS | CRITERIA* |
|---|---|---|
| **MECHANICAL SYNDROME** | | **SYMPTOM RESPONSE** |
| **Derangement** | Derangement Syndrome is a clinical presentation associated with mechanical obstruction of an affected joint. | Centralisation (in the spine)<br>Directional Preference<br>Variable<br>Produce / Abolish<br>Increase/ Decrease,<br>Centralise/ Peripheralise,<br>Better / Worse |
| **Dysfunction** | Dysfunction Syndrome is a clinical presentation associated with mechanical deformation of structurally impaired soft tissues. Articular or contractile structures can be affected. | Articular: Pain consistently produced at restricted end-range<br>Contractile: Pain consistently produced with loading.<br>Produce / No Worse |
| **Postural** | Postural Syndrome is a clinical presentation associated with mechanical deformation of soft tissues or vascular insufficiency arising from prolonged positional or postural stresses affecting either the articular structures or the contractile structures. | No pain with movement or activity.<br>Pain produced by prolonged static loading of normal tissues |
| **Spinal OTHER** | Do not fit the criteria of Derangement, Dysfunction or Postural Syndromes.<br>Definitions contained in Table of OTHER | Symptom response dependent on the sub-group of OTHER. |

## OPERATIONAL DEFINITIONS

The operational definitions describe the symptom and mechanical behaviours and the time scale needed to document each category.

### Derangement Syndrome

Inconsistency and change is a characteristic of the Derangement Syndrome. Its clinical presentation is variable:

- Location of pain may be local, referred or radicular or a combination
- Symptoms may move from side to side, proximally and distally
- Symptoms may be constant or intermittent
- Therefore they are variable during the day and over time
- Pain may arise gradually or suddenly, often with an insidious onset
- Onset may be accompanied by sudden disability
- Symptomatic and mechanical presentations are influenced by postural loading strategies during activities of daily living
- Movements and postures cause symptoms to increase/decrease, centralise/ peripheralise, produce/abolish
- Sustained postures and activities can rapidly and progressively worsen or improve the severity and spread of pain
- May have history of previous episodes
- Mechanical presentation always includes diminished range or obstruction of movement
- May include temporary deformity, e.g. kyphosis, lordosis, lateral shift
- Deviation of normal movement pathways
- Loading strategies can cause lasting changes
- Repeated movements cause symptoms to produce/abolish, increase/decrease, and pain to centralise/peripheralise
- Repeated movements cause increase/decrease in range of movement

Time scale

- A Derangement can be identified on day one, or
- A Derangement will be suspected on day one and a provisional diagnosis made. This will be confirmed, by a lasting change in symptoms after evaluating the response to a full mechanical evaluation within five visits.
- Aggravating factors may precipitate a deterioration in symptoms and a longer recovery process.

### Dysfunction Syndrome

Consistent production of pain at restricted end range is a characteristic of the Dysfunction Syndrome:

- Present for at least 8-12 weeks
- Pain is Always local except in the case of an Adherent Nerve Root (ANR)
- Pain is ALWAYS Intermittent and produced only when loading structurally impaired tissue
- Symptoms cease when loading is ended, and the pain never lasts
- Consistent direction and amount of movement produces pain

- Restricted movement(s) in one or more planes
- Appropriate repeated movement will produce symptoms, which do not remain worse

**ANR:** (a specific type of Dysfunction seen in the spine)

- History of sciatica or surgery in the last few months that has improved, but is now unchanging, and
- Symptoms are intermittent, and
- Symptoms in the thigh and/or calf, including 'tightness', and
- Flexion in standing, long sitting, and straight leg raise are clearly restricted and consistently produce concordant pain or tightness at end-range, and
- There is no rapid reduction or abolition of symptoms, and no lasting production of distal symptoms.

Time scale

- A dysfunction/ANR category patient will be suspected on day one once Derangement has been excluded and a provisional diagnosis made. This will be confirmed after evaluating the response to a mechanical evaluation within five visits.
- Rapid change will not occur in this syndrome, and
- Symptoms and movement loss will gradually improve over many weeks.

**Postural Syndrome**

Intermittent pain produced with sustained postural loading is characteristic of Postural Syndrome.

- Usually young
- Sedentary lifestyle
- Time is an essential causative factor
- Symptoms always local and intermittent
- May have simultaneous cervical, thoracic, and lumbar pain
- Brought on only by prolonged static loading of normal tissues
- No pain with movement or activity
- Most common provocative posture is slumped sitting
- Poor posture – forward head posture, increased thoracic kyphosis, reduced lumbar lordosis.
- Posture correction abolishes
- No movement loss
- Repeated movements have no effect
- Pain produced / abolished with sustained tests.

Time scale

- A posture category patient will be suspected on day one and a provisional diagnosis made.
- This will be confirmed after evaluating the response to a mechanical evaluation within two / three visits.

# McKenzie Classification – Spinal OTHER

| Serious pathology (list is not exhaustive) | | |
|---|---|---|
| **Category** | **Clinical findings (Red Flags)** | **Clinical Examples** |
| Cancer | Age >55, **history of cancer**, unexplained weight loss, progressive, not relieved by rest | May be primary site or metastases |
| Cauda equina syndrome /cord compression | Bladder / bowel dysfunction, saddle anaesthesia, global or motor weakness in legs. Clumsiness in legs | |
| Spinal fracture | History of severe trauma, older age, prolonged steroid use OR young, active with sport related back pain | Compression fracture, stress fracture of the pars |
| Spinal related infection | Fever, malaise, constant pain, all movements worsen | Epidural abscess, discitis, transverse myelitis |
| Vascular | Vascular disease, smoking history, family history, age over 65, male>female<br>History of trauma, dizziness, diplopia, dysarthria and multiple other non-mechanical symptoms | Abdominal aortic aneurism, cervical artery dysfunction |

| Subgroup | Definition | Criteria (common) | Clinical examples |
|---|---|---|---|
| **Chronic Pain Syndrome** | Pain-generating mechanism influenced by psychosocial factors or neurophysiological changes | Persistent widespread pain, aggravation with all activity, disproportionate pain response to mechanical stimuli, inappropriate beliefs and attitudes about pain. | |
| **Inflammatory** | Inflammatory arthropathy | Constant pain, morning stiffness, excessive movements exacerbate symptoms | RA, sero-negative arthritis, ankylosing Spondylitis |
| **Mechanically Inconclusive** | Unknown musculoskeletal pathology | Derangement, Dysfunction, Postural and subgroups of OTHER excluded.<br>Symptoms affected by positions or movements BUT no recognisable pattern identified OR inconsistent symptomatic and mechanical responses on loading | |
| **Mechanically Unresponsive Radiculopathy** | Radicular presentation consistent with a currently unresponsive nerve root compromise | Symptoms presenting in a radicular pattern in the upper or lower extremity.<br>Accompanied by varying degrees of neurological signs and symptoms.<br>There is no centralisation and symptoms do not remain better as a result of any repeated movements, positions or loading strategies | |
| **Post-Surgery** | Presentation relates to recent surgery | Recent surgery and still in post-operative protocol period | |
| **Sacro-iliac (SIJ)/Pregnancy-Related Pelvic Girdle Pain (PGP)** | Pain-generating mechanism emanating from the SIJ or symphysis pubis | Three or more positive SIJ pain provocation tests having excluded the lumbar spine and hip | If related to pregnancy: PGP |
| **Spinal Stenosis** | Symptomatic degenerative restriction of spinal canal or foramina | Lumbar Spine: older population, history of leg symptoms relieved with flexion activities and exacerbated with extension, longstanding loss of extension. Cervical Spine: arm symptoms consistently produced with closing foramen, abolished or decreased with opening | Lumbar stenosis, cervical lateral foraminal stenosis |
| **Structurally Compromised** | Soft tissue and/or bony changes compromising joint integrity | Mechanical symptoms (ROM restricted, clunking, locking, catching).<br>May have sensation of instability<br>Long history of symptoms or history of trauma.<br>Irreversible with conservative care. | Painful structural scoliosis, painful osteoporosis, grade 3-4 spondylolisthesis, upper cervical structural instability – RA |
| **Trauma/ Recovering Trauma** | Recent trauma associated with onset of symptoms | Recent trauma associated with onset of constant symptoms / recent trauma associated with onset of symptoms, now improving and pain intermittent | Post whiplash |

## DEFINITION OF TERMS:

### Centralisation

- **Centralisation** describes the phenomenon by which distal pain originating from the spine is progressively abolished in a distal to proximal direction. This is in response to a specific repeated movement and / or sustained position and this change in location is maintained over time until all pain is abolished. As the pain centralises there is often a significant increase in the central back pain**.** If back pain only is present, this moves from a widespread to a more central location and then is abolished.

- **Centralising** means that during the application of loading strategies distal pain is being abolished. The pain is in the *process* of becoming centralised, but this will only be confirmed once the distal pain remains abolished.

- **Centralised** means that as a result of the application of the appropriate loading strategies the patient reports that all distal pain has abolished and now the patient only has back pain. The central back pain will then continue to decrease and abolish.

#### Characteristics of Centralisation

- Only occurs in Derangement Syndrome
- Occurs in response to loading strategies (repeated movements or postures)
- Is usually a rapid and always a lasting change in pain location
- Can be reliably assessed

### Peripheralisation:

- **Peripheralisation** describes the phenomenon by which proximal symptoms originating from the spine are progressively produced in a proximal to distal direction. This is in response to a specific repeated movement and / or sustained position and this change in location of symptoms is maintained over time. This may also be associated with a worsening of neurological status.

- **Peripheralising** means that during the application of loading strategies distal symptoms are being produced. Symptoms are in the *process* of becoming peripheralised but this will only be confirmed once the distal symptoms remain.

- **Peripheralised** means that as a result of the application of the inappropriate loading strategies the patient reports that the distal symptoms that have been produced remain.

#### Characteristics of Peripheralisation

- The lasting production and/or worsening of distal symptoms
- Occurs in response to loading strategies (repeated movements or postures)

**Directional Preference**

Directional Preference describes the clinical phenomenon where a specific direction of repeated movement and / or sustained position results in clinically relevant improvement in either symptoms and / or mechanics though not always the Centralisation of the symptoms. It is an essential feature of the Derangement Syndrome.

**Differences between Centralisation and Directional Preference**

Directional Preference encompasses a broader range of responses than Centralisation. **Centralisation** refers to the lasting change in the location of pain as a result of loading strategies, whereas **Directional Preference** results in a lasting improvement in symptoms and / or mechanics though not always a change in location of pain. Thus all centralisers have a directional preference **But** not all those who have a directional preference are centralisers.

**Characteristics common to Centralisation and Directional Preference**

Who do they occur with?

- Occurs in Derangement Syndrome
- Occurs in both acute and chronic patients

What do they occur with?

- Occurs with specific repeated movements or sustained postures
- Occurs most commonly with extension
- Occurs less commonly with lateral movements or flexion

What are they accompanied by?

- Is accompanied by improvements in mechanical presentation

What do they indicate?

- The classification of Derangement
- The correct movement / sustained position for management
- A good prognosis
- Failure to achieve indicates poor prognosis

**Descriptions of Derangements**

**Posterior Derangements –** this term is used to describe spinal Derangements that have a directional preference for extension procedures / positions.

**Anterior Derangements –** this term is used to describe spinal Derangements that have a directional preference for flexion procedures / positions.

Some Derangements have a directional preference for combined directions and are described accordingly e.g. postero/ lateral, antero/lateral.

**Pain Locations of Derangements** – The location of pain in Derangements is categorised under three headings:

- Central or Symmetrical
- Unilateral or Asymmetrical above the knee
- Unilateral or Asymmetrical below the knee

## Deformities Observed in the Lumbar Spine

Kyphotic Deformity
The patient's lumbar spine is positioned in flexion and the patient is unable to extend.

Lordotic Deformity
The patient's lumbar spine is positioned in extension and the patient is unable to flex.

Lateral Shift Deformity
The patient's trunk and shoulders are positioned laterally in relation to the pelvis and the patient is unable to correct the shift.

## Lateral Shift

### Right and left lateral shift

- A RIGHT lateral shift exists when the vertebra above has laterally flexed to the right in relation to the vertebra below, carrying the trunk with it. The upper trunk and shoulders are shifted to the right.
- A LEFT lateral shift exists when the vertebra above has laterally flexed to the left in relation to the vertebra below, carrying the trunk with it. The upper trunk and shoulders are shifted to the left.

### Contralateral and ipsilateral shift

- CONTRALATERAL shift exists when the patient's symptoms are in one leg and the shift is in the opposite direction. For instance right leg pain with upper trunk and shoulders shifted laterally to the left.
- IPSILATERAL shift exists when the patient's symptoms are in one leg and the shift is to the same side. For instance right leg pain with upper trunk and shoulders shifted laterally to the right.

### Criteria to establish the clinical relevance of a lateral shift

- Upper body is visibly and unmistakably shifted to one side
- Onset of shift occurred with back pain
- Patient is unable to correct shift voluntarily
- OR, if patient is able to correct shift they cannot maintain correction
- Correction affects intensity of symptoms
- Correction causes either centralisation or worsening of peripheral symptoms

# APPENDIX 4:

# REFERENCES

# APPENDIX FOUR

## REFERENCES

### LITERATURE RELEVANT TO THE McKENZIE APPROACH – LUMBAR SPINE CORE LIST

The Lumbar Spine CORE LIST contains articles published in peer review journals that are directly relevant to the McKenzie approach.

The following articles are grouped together according to the type of study as follows:

**Guidelines** – National and International guidelines that feature the McKenzie Method.

**Systematic Reviews** - These reviews use clearly defined strategies for searching the literature, explicit criteria for appraising the quality of papers reviewed, and a validated method of analysing those papers. They are considered the strongest form of evidence in the hierarchy of evidence to judge health care interventions.

**Reviews** - These papers review aspects of treatment, but not in a systematic way.

**Trials** - These are randomised controlled trials, which are considered to be the strongest source of primary evidence about interventions. The trials either purport to use the McKenzie method or are relevant to some aspect of the approach; not all however use the method in its true form.

**Centralisation** – These are primary research papers that illustrate the prognostic value of centralisation – most, though not all, studies relate to the lumbar spine.

**Observational studies** – case series and case studies involving the McKenzie method.

**Surveys of physical therapy practice** – General surveys of physical therapy practice, which include therapists' use of the McKenzie approach.

**Studies into assessment, diagnosis and procedures** - These are primary research studies into the reliability and validity of McKenzie assessment, or aspects of it. Also included here are articles about classification of back pain, and descriptions of some techniques.

**Anatomical, physiological and pain studies** - In vitro and in vivo studies looking at the effects of different mechanical loading. For instance reviews of different postures, the effects of flexion/extension on intradiscal material, pain provocation studies etc.

**Discussion articles -** Papers in which the authors present a didactic analysis of some aspect of spinal care relevant to the McKenzie approach.

## LUMBAR SPINE

### GUIDELINES (selected; more on MII website reference list)

**American College of Occupation and Environmental Medicine, Exercise and Manipulative Therapies for Treatment of Acute and Subacute Low Back Pain. *Elk Grove Village, IL:ACOEM,* 2005**

McKenzie method is recommended as a classification based treatment system and some of the relevant evidence presented.

**Bach SM, Holten KB, What's the best approach to acute low back pain? *J Fam Pract, 58.E1-E3,* 2009**

McKenzie exercises are recommended with good-quality patient-oriented evidence.

**Danish Institute for Health Technology Assessment, Low-back pain. Frequency, management and prevention from an HTA perspective. *1-106,* 1998**

This wide ranging review and guideline includes a summary of the McKenzie approach, both as a treatment and as a diagnostic method. They concluded there was limited evidence to support its use as a treatment for both acute and chronic back pain, and moderate evidence indicating its value as a diagnostic tool and prognostic indicator.

**Delitto A, George SZ, van Dillen L, Denninger TR, Sowa G, Shekelle P, Godges JJ, Low back pain. Clinical practice guidelines linked to the International Classification of Functioning, Disability, and Health from the Orthpaedic Section of the American Physical Therapy Association, JOSPT, *41:1-101,* 2011**

Clinical guidelines that address numerous aspects of back pain, such as classification, red flags, risk factors, outcome measures, physical examination tests, screening tools, and interventions. Amongst other recommendation it was recommended that clinicians should use specific repeated movements to promote centralization in patients with acute low back pain; with recommendation based on strong evidence.

**Philadelphia Panel, Evidence-based clinical practice guidelines on selected rehabilitation interventions for low back pain. *Phys Ther, 81; 1641-1674,* 2000**

These guidelines have been developed using a structured and rigorous methodology. For sub-acute and chronic back pain they recommend that there is good evidence to include certain specific exercises, including the McKenzie method.

**Poitras S, Rossignol M, Dionne C, Tousignant M, Truchon M, Arsenault B, Allard P, Cote M, Neveu A, An interdisciplinary clinical practice model for the management of low-back pain in primary care: the CLIP project. *BMC Musculoskeletal Dis, 9.54 http://www.biomedcentral.com/1471-2474/9/54,* 2008**

Development of a clinical management model for back pain patients from previously published guidelines and systematic reviews. McKenzie approach was listed as a recommended therapeutic intervention for acute and for chronic back pain with poor scientific evidence; and for sub-acute back pain with moderate scientific evidence.

**Rossignol M et al, Clinique des Lombalgies Interdisciplinaire en Premiee ligne. *CLIP, http://www.santepub-mtl.qc.ca/Publication/pdftravail/CLIPenglish.pdf,* 2005**

McKenzie recommended for sub-acute back pain with moderate scientific evidence, and for chronic back pain with weak scientific evidence.

 

**Work Loss Data Institute. Encinitas, CA, Official Disability Guidelines - Treatment in Workers Comp (ODG), *Online ODG; http://worklossdata.com,* 2008**

McKenzie recommended for acute and chronic back pain. Guidelines noted the reliability of assessment with trained therapists; the value of sub-grouping using centralisation; and the ability of McKenzie method to improve pain and disability in the short-term. This was supported by best levels of evidence: systematic reviews and RCTs.

## SYSTEMATIC REVIEWS (selected; more on MII website reference list)

**Chorti AG, Chortis AG, Strimpakos N, McCarthy CJ, Lamb SE, The prognostic value of symptom responses in the conservative management of spinal pain. A systematic review., *Spine, 34:2686-2699,* 2009**

22 articles were included; most symptom responses were not prognostic of clinical outcomes. Only changes in pain location and pain intensity with repeated movements or in response to treatment were associated with outcomes.

**Clare HA, Adams R, Maher CG, A systematic review of efficacy of McKenzie therapy for spinal pain. *Aust J Physiother, 50(4):209-16,* 2004**

Systematic review of 5 trials deemed to be truly evaluating McKenzie method with pooled data showing greater pain relief (8.6 on a 100 scale) and greater reduction in disability (5.4 on 100 scale) than comparison at short-term (less than 3 months). At 3 to 12 months results were unclear.

**Dunsford A, Kumar S, Clarke S, Integrating evidence into practice: use of McKenzie-based treatment for mechanical low back pain. *J Multidisciplinary Healthcare, 4.393-402,* 2011**

A systematic review that included 4 high quality studies that showed that directional preference exercises were an effective intervention in 3 / 4, showing significant differences compared to a range of controls, regardless of duration of symptoms. They also presented a case study of a patient with back and leg pain who demonstrated directional preference in response to repeated extension.

**Fairbank J, Gwilym SE, France JC, Daffner SD, Dettori J, Hersmeyer J, Andersson G., The role of classification of chronic low back pain. *Spine, 36:S19-S42,* 2011**

A review of 28 classification systems: 16 diagnostic, 7 prognostic, and 5 treatment-based systems. They found the McKenzie system had strong evidence for reliability, and moderate evidence for effectiveness. Reliability increased with training and experience with a classification system.

**Fersum KV, Dankaerts W, O'Sullivan PB., Integration of sub-classification strategies in RCTs evaluating manual therapy treatment and exercise therapy for non-specific chronic low back pain: a systematic review. *Br J Sports Med, 44:14:1054-64,* 2010**

Only 5 out of 68 studies sub-classified patients. Meta-analysis showed a statistically significant difference in favour of classification-based treatment over control for reduction in pain (p=0.004) and disability (p=0.0005).

**Hancock MJ, Maher CG, Latimer J, Spindler MF, McAuley JH, Laslett M, Bogduk N, Systematic review of tests to identify the disc, SIJ or facet joint as the source of low back pain. *Eur Spine J, 16:1539-1550,* 2007**

28 studies investigated the disc, 8 the facet joint and 7 the SIJ. Various features on MRI were suggestive of disc pathology: high intensity zone likelihood ratio (LR) 1.5 to 5.9, disc degeneration 1.6 to 4.0, endplate changes 0.6 to 5.9. Centralisation and

likelihood of disc pathology had LR of 2.8. Single tests of SIJ were uninformative; multiple pain provocation tests had LR of 3.2 and negative LR of 0.29. None of the facet tests were found to be informative.

**Hettinga DM, Jackson A, Klaber Moffett J, May S, Mercer C, Woby SR, A systematic review and synthesis of higher quality evidence of the effectiveness of exercise interventions for non-specific low back pain of at least 6 weeks duration. *Phys Ther Rev, 12:221-232,* 2007**

This systematic review found that higher quality evidence supported the use of strengthening exercises, organised aerobic exercise, general exercises, hydrotherapy and McKenzie exercises for back pain of at least 6 weeks duration.

**Kent P, Mjøsund HL, Petersen D, Does targeting manual therapy and/or exercise improve patient outcomes in nonspecific low back pain? A systematic review. *BMC Medicine, 8:22,* 2010**

A systematic review of targeted versus non-targeted exercise or manual therapy that included 4 studies; 1 McKenzie and 3 treatment-based classification system based. There was a statistically significant effect short-term for directional preference exercises. Overall there was only very cautious evidence supporting targeted treatment improves patient outcome.

**Kolber MJ, Hanney WJ, The dynamic disc model: a systematic review of the literature. *Phys Ther Rev, 14:181-189,* 2009**

Review of the dynamic disc model that suggests that the nucleus pulposus migrates in response to movement and positions. Twelve articles were located that demonstrated in vitro and in vivo that the nucleus migrated anteriorly during extension ad posteriorly during flexion. There was limited and contradictory data to support this model in the symptomatic and degenerated disc.

**Machado LAC, de Souza MvS, Ferreira PH, Ferreira ML, The McKenzie Method for low back pain. A systematic review of the literature with a meta-analysis approach, *Spine, 31:E254-E262,* 2006**

Systematic review that included 11 trials and concluded that there is some evidence that the McKenzie method is more effective than passive therapies for acute back pain, but the size of treatment effect is unlikely to be clinically worthwhile. There is limited evidence for the McKenzie method in chronic back pain and overall effectiveness is not established. However the authors largely failed to perform the meta-analysis they intended, and many studies were included in which treatment was not classification based.

**Petersen T, Laslett M, Juhl C, Clinical classification in low back pain: best-evidence diagnostic rules based on systematic reviews. BMC Musculoskeletal Dis. 18:188, 2017**

This systematic review examined the latest evidence for the patho-anatomic diagnosis in the lumbar spine. There was 'sufficient evidence' to suggest a clinical diagnostic rule in some cases, but not in others. The presence, or lack of, centralisation was a key assessment finding in the diagnostic process for the disc and for the SIJ.

**Slade SC, Keating J, Unloaded movement facilitation exercise compared to no exercise or alternative therapy on outcomes for people with non-specific chronic low back pain: a systematic review. *J Manipulative Physiol Ther, 30:301-311,* 2007**

A review of unloaded exercises facilitating lumbar spine movement compared to a no-treatment control or other treatment; of the 6 studies located 4 used the McKenzie system. Strong evidence was found that such exercises improve pain and function

 

compared to no exercise. The evidence slightly favoured McKenzie when compared to strengthening and stabilisation exercises.

**Stynes S, Konstantinou K, Dunn K, Classification of patients with low back-related leg pain: a systematic review. *BMC Musculoskeletal Dis, 17:226*, 2016**

This review looks at the relevant literature that classify / subgroup populations with low back-related leg pain, and how leg pain due to nerve root involvement is described and diagnosed in the various systems. The McKenzie System scored the highest of any system on criteria based upon validity, feasibility, reliability and generalisability.

**Surkitt LD, Ford JJ, Hahne AJ, Pizzari T, McMeeken JM., Efficacy of directional preference management for low back pain: a systematic review. *Phys Ther, 2012:92:652-665,* 2012**

Six trials involving directional preference management were included in this systematic review; 5 deemed to be of high quality. Results were mixed, but there was moderate evidence that directional preference exercises were more effective than a range of comparison treatments short, medium and long-term. No trials found these were less effective.

## REVIEWS (selected; more on MII website reference list)

**Bardin L, King P, Maher C, Diagnostic triage for LBP: a practical approach to primary care. Med J Aust. 206,6:240-241, 2017**

The narrative review updates the diagnostic triage process. It details the diagnostic specifics of Radicular Syndrome and of Serious Pathology. It also outlines some of the options for management approaches.

**Berthelot JM, Delecrin J, Maugars Y, Passuti N, Contribution of centralization phenomenon to the diagnosis, prognosis, and treatment of discogenic low back pain. *Joint Bone Spine, 74:319-323,* 2007**

This review of centralisation concluded that it may indicate discogenic pain and is associated with better outcomes.

**Donelson R, Improving spine care using Mechanical Diagnosis and Therapy. *SpineLine, October 19-26,* 2012**

Summary of the system, with references, as relevant to the lumbar spine.

**Donelson R, Evidence-based low back pain classification. *Eur Med Phys, 40:37-44,* 2004**

Review of literature supporting Mechanical Diagnosis and Treatment includes the value of a non-specific classification system, the value of establishing directional preference, its reliability as an assessment system, and the prevalence of centralisation in the back pain population.

**Ford JJ, Surkitt LD, Hahne AJ., A classification and treatment protocol for low back disorders Part 2 - Directional preference management for reducible discogenic pain. *Phys Ther Rev, 16:423-437,* 2011**

Presentation of directional preference management with other elements for reducible discogenic pain as the protocol to be followed in a trial protocol for patients classified with derangement and randomised to directional preference exercises or evidence-based practice.

**Karayannis NV, Jull GA, Hodges PW., Physiotherapy movement based classification approaches to low back pain: comparison of subgroups through review and developer/ expert survey. *BMC Muscul Dis, 13:24,* 2012**

A review of classification systems with confirmation from system experts. Five dominant movement based schemes were identified; including Mechanical Diagnosis and Therapy, Treatment-Based Classification, and Pathoanatomic classification systems. There was considerable diversity in how movement informs sub-grouping, but 2 dominant movement paradigms emerged: the 3 systems above all used loading strategies to elicit centralisation, the other 2 systems used modified movement strategies to document movement impairments.

**Laslett, Mark., A Clinical Review: Evidence Based Diagnosis and Treatment of the Painful Sacroiliac Joint., *JMMT, 16(3):142-154,* 2008**

**Maher C, Underwood M, Buchbinder R, Non-specific low back pain. *The Lancet, Published online Oct,* 2016**

This 'Seminar' gives an overview of the current literature on non-specific low back pain. Review topics include epidemiology, risk factors, costs, clinical presentations, differential diagnosis, diagnostic investigations, prevention, clinical course, management and controversies. The review concludes that a research priority is the identification of LBP 'phenotypes', so that treatment can be targeted rather than generalised.

**May S, Donelson R, Evidence-informed management of chronic low back pain with the McKenzie Method. *Spine J, 8.134-141,* 2007**

Review that examines evidence for McKenzie method in an edition of Spine Journal that investigates the evidence for a wide range of different approaches in the treatment of chronic low back pain. Four guidelines, 5 systematic reviews, and 3 RCTs are quoted.

**Murphy DR, Hurwitz EL, A theoretical model for the development of a diagnosis-based clinical decision rule for the management of patients with spinal pain. *BMC Musculoskel Dis, 8.75,* 2007**

Clinical decision rule hypothesis that starts by excluding patients with red flags and addressing centralisation first before considering other management strategies.

**Wetzel FT, Donelson R, The role of repeated end-range / pain response assessment in the management of symptomatic lumbar discs. *Spine J, 3:146-154,* 2003**

Review of current literature regarding usefulness of dynamic mechanical assessment for diagnosis and management of reversible discogenic pathology: and identification of irreversible pathology that may benefit from surgery.

## TRIALS (selected; more on MII website reference list)

**Al-Obaidi S, Al-Sayegh N, Ben Nakhi H, Al-Mandeel M, Evaluation of the McKenzie Intervention for Chronic Low Back Pain by Using Selected Physical and Bio-Behavioral Outcome Measures, *Phys Med Rehab, Vol 3 (7): 637-646,* 2011**

133 of 237 patients with chronic LBP demonstrated centralization; 62, who all demonstrated centralisation, met inclusion criteria and consented to participate and were followed up 5 and 10 weeks after completion of treatment. There were improvements in fear-avoidance and disability beliefs, pain and physical performance measures at 5 weeks, that mostly remained stable at 10 weeks.

**Albert HB, Manniche C., The efficacy of systematic active conservative treatment for patients with severe sciatica. A single-blinded randomized controlled trial. *Spine, 37:7:531-542,* 2011**

181 patients with severe sciatica were randomised to directional preference exercises or sham non-back related exercises, with both groups being provided with information and advice to stay active. A mean of 4.8 treatment sessions was given. Both groups improved over time, and there were significant difference that favoured the directional preference exercises group in terms of global assessment of improvement, and improvement in neurological signs; and a trend to better outcomes in leg pain.

**Alexander AH, Jones AM, Rosenbaum Jr D H:, Nonoperative Management of Herniated Nucleus Pulposus: Patient Selection by the Extension Sign-Long term Follow-up. *Orthopaedic Review, 21;181-188,* 1991**

Follow-up study of 33/73 patients with acute disc herniation treated conservatively. Those unable to gain extension by 5 days were treated surgically. Ability to regain extension was a better predictor of outcome than a variety of other clinical and neurological signs and symptoms.

**Apeldoorn AT, Bosmans JE, Ostelo RW, de Vet HCW, van Tulder MW., Cost effectiveness of a classification-based system for sub-acute and chronic low back pain. *Eur Spine J, 21(7):1290-300,* 2012**

156 patients classified by the treatment-based classification system (directional preference exercises, manipulation, or stabilisation exercises) and then randomised to classification-based treatment or usual physiotherapy care. The classification-based group was only significantly better on global perceived effect, but no other outcome measure; but was not cost effective.

**Apeldoorn AT, Ostelo RW, van Helvoirt H, Fritz JM, Knol DL, van Tulder MW, de Vet HCW., A randomized controlled trial on the effectiveness of a classification-based system for subacute and chronic low back pain. *Spine, 37:1347-1356,* 2012**

This trial compared treatment according to the treatment-based classification system, which includes a directional preference exercise group, to usual physiotherapy in 156 patients with subacute or chronic low back pain. There were no significant differences in outcomes between the groups.

**Brennan GP, Fritz JM, Hunter SJ, Thackeray A, Delitto A, Erhard RE, Identifying subgroups of patients with acute/sub acute non-specific low back pain. *Spine, 31:623-631,* 2006**

A randomised clinical trial comparing manipulation, stabilisation and directional preference exercises, but also analysing results according to whether patients were treated by classification sub-group or not. Classification sub-groups were determined by clinical features gathered at baseline. There were no significant differences between randomised treatment groups, but there were significant differences between patients matched with their classification sub-group and those unmatched.

**Broetz D, Hahn U, Maschke E, Wick W, Kueker W and Weller M, Lumbar disc prolapse: Response to mechanical physiotherapy in the absence of changes in magnetic resonance imaging. Report of 11 cases. *NeuroRehabilitation, 23(3): 289-294,* 2007**

11 patients with MRI confirmed disc prolapse with over half having weakness and sensory loss were treated with repeated end-range movements and re-evaluated after 5 treatment sessions. Centralisation occurred in 8 of 11 and all patients showed improvements in signs and symptoms, but no changes in MRI features.

**Browder DA, Childs JD, Cleland JA, Fritz JM, Effectiveness of an extension-oriented treatment approach in a subgroup of subjects with low back pain: a randomized clinical trial. *Phys Ther, 87.1608-1618,* 2007**

About 300 patients evaluated for eligibility of who 63 met inclusion criteria: back pain with referral below the buttock, plus centralization with 10 repeated extension exercises in standing or lying. These 63 patients were randomised to an extension protocol (extension exercises and posterior-to-anterior mobilisation) or strengthening programme for flexors and extensors. There were significant differences at 1 and 4 weeks and at 6 months for Oswestry scores favouring the extension protocol group, but only in pain scores at 1 week. There were significant differences in centralization of symptoms favouring the extension protocol group.

**Cherkin DC, Deyo RA, Battie M, Street J, Barlow W., A comparison of physical therapy, chiropractic manipulation, and provision of an educational booklet for the treatment of patients with low back pain. *N Engl J Med, Oct 8;339(15):1021-9,* 1997**

McKenzie therapy and chiropractic manipulation are equally effective and both are slightly superior to the booklet in terms of patient satisfaction and short-term symptom reduction. The long-term outcome measures were the same in all 3 groups, including recurrences and care-seeking. The cost of the booklet group was considerably less than the 2 other groups.

**Delitto A, Cibulka MT, Erhard RE, Bowling RW, Tenhula JA, Evidence for use of an extension-mobilization category in acute low back syndrome: a prescriptive validation pilot study., *Phys Ther, Apr;73(4):216-22,* 1992**

Delitto suggests that treatment strategy based on signs and symptoms and response to movement may result in a more effective outcome compared with an unmatched non-specific treatment. Patients classified as extension-responders did better with an extension, than a flexion oriented programme.

**Delitto A, Piva S, Moore C, Fritz J, Wisniewski S, Josbeno D, Fye M, Welch W, Surgery Versus Nonsurgical Treatment of Lumbar Spinal Stenosis. *Annals of Internal Medicine, 162,7,* 2014**

This RCT compared surgical decompression to physical therapy for patients with spinal stenosis. 169 patients participated with a 2 year follow up. The PT group were given flexion based exercises, general conditioning and education. Both groups improved and there were no differences in outcome between the two groups for function or pain. However, there were a significant number of crossovers between the PT and surgical group

**Donelson R, Long A, Spratt K, Fung T., Influence of directional preference on two clinical dichotomies: acute versus chronic pain and axial low back pain versus sciatica. *Phys Med Rehabil, 23:4(9):667-81,* 2012**

Secondary analysis of data from Long et al. (2004) of patients with a directional preference and treated with directional preference exercises to see if there was any difference in outcomes across duration of pain or between QTF categories (1 = low back pain only; 2 = plus thigh pain; 3 = plus calf pain; 4 = plus neurological signs and symptoms). For patients with acute, subacute and chronic there were no significant difference in 5 / 6 outcomes at 2 weeks, but patients with chronic pain had less reduction in back pain intensity. Across different QTF groups there were no significant differences in all 6 outcomes at 2 weeks.

 

**Fritz JM, Delitto A, Erhard RE, Comparison of classification-based physical therapy with therapy based on clinical practice guidelines for patients with acute low back pain. A RCT. *Spine, 28:1363-1372,* 2003**

78 patients with acute back pain randomised to AHCPR guidelines or care based on classification by therapist. Patients in classification group had significantly better functional outcomes at 4 weeks, and less work loss in follow-up year.

**Garcia AN, Costa LCM, da Silva TM, Gondo LFB, Cyrillo FN, Costa RA, Costa LOP, Effectiveness of back school versus McKenzie exercises in low back pain, *Phys Ther, 93(6):729-47,* 2013**

A randomised controlled trial with 148 chronic back pain patients with follow-up at 1, 3 and 6 months who received either 4 group back school standardised intervention or individualised McKenzie exercises based on directional preference. There was a clinically important difference in terms of disability, but not pain, for the McKenzie method short-term, but not long-term. It documents that roughly the same percentage had a directional preference (approximately 66.5%), but it is not documented how this was assessed, nor how this shaped management in the back school group. It is documented that the therapists who gave the McKenzie management were fully certified, but in fact had only attained part A course.

**Garcia A, Costa L, Hancock M, Souza F, Gomes G, Oliveira de Almeida M, Costa L, McKenzie Method of MDT was slightly more effective than placebo for pain, but not for disability, in patients with chronic non-specific LBP: a randomised placebo controlled trial with short and long-term follow-up. *Br J Sports Med. Online July 2017***

A randomised controlled trial with 148 chronic back pain patients with follow-up at 1, 3 and 6 months who received either 4 group back school standardised intervention or individualised McKenzie exercises based on directional preference. There was a clinically important difference in terms of disability, but not pain, for the McKenzie method short-term, but not long-term. It documents that roughly the same percentage had a directional preference (approximately 66.5%), but it is not documented how this was assessed, nor how this shaped management in the back school group. It is documented that the therapists who gave the McKenzie management were fully certified, but in fact had only attained part A course.

**Halliday M, Pappas E, Hancock M, Clare H, PT, Pint R, Robertson G PT, Ferreira P, A Randomized Controlled Trial Comparing the McKenzie Method to Motor Control Exercises in People With Chronic Low Back Pain and a Directional Preference. *J Orth Sports Phys Ther, 46, 7, 514-522,* 2016**

In a LBP population with the classification of Derangement, this RCT primarily compared MDT to motor control exercises for the restoration of muscle recruitment. Muscle thickness recovered equally in both groups. The only significant difference in any secondary outcome was with Global Perceived Improvement, which favoured the McKenzie group.

**Hebert J, Fritz J, Koppenhaver S, Thackeray A, Kjaer P, Predictors of clinical outcome following lumbar disc surgery: the value of historical, physical examination, and muscle function variables. *Eur Spine J, 25, 310-7,* 2015**

This study looked at the pre-op predictors of a successful outcome post lumbar surgery. Pre-operative peripheralisation was associated with greater improvements in pain and disability after multivariate analysis 10 weeks post-op. Per-op multifidus function was not associated with clinical outcome.

 

**Larsen K, Weidick F, Leboeuf-Yde C., Can passive prone extensions of the back prevent back problems?: a randomized, controlled intervention trial of 314 military conscripts. *Spine, Dec 15;27(24):2747-52,* 2001**

314 male conscripts randomised into 2 groups: one group received theory session based on TYOB, disc model, tape to back, and instructed to do 15 EIL X 2 a day for period of military duty. 214 (68%) completed follow-up at 12 months. 1-year prevalence LBP in experimental group 33%, compared to 51% in control. Numbers seeking medical help for LBP also significantly less (9% to 25%). In those who had reported LBP at baseline 1-year prevalence 45% to 80%.

**Long A, Donelson R, Fung T, Does it matter which exercise? A randomized control trial of exercises for low back pain. *Spine, Dec 1;29(23):2593-2602,* 2004**

Following a mechanical evaluation all patients who demonstrated directional preference (DP) (230/312, 74%) were randomised to receive exercise matched to DP (1), exercise opposite to DP (2) or evidence-based management (3). Over 30% of groups 2 and 3 withdrew because of failure to improve or worsening, compared to none in group 1. Over 90% of group 1 rated themselves better or resolved at 2 weeks, compared to just over 20% (group 2) and just over 40% (group 3). There were further significant differences between the groups in back and leg pain, functional disability, depression and QTF category.

**Long A, Donelson R, Fung T, Spratt K, Are acute, chronic, back pain-only, and sciatica-with neural deficit valid low back subgroups? Not for most patents. *Spine J, 7;5:63S-64S,* 2007**

Sub-group analysis from previous RCT (Long et al 2004) of 80 with directional preference who were treated with exercises matched to directional preference. There were no significant differences in outcomes between QTF groups 1-4, and in 5 of 7 outcomes between acute and chronic groups, but chronic patients reported significantly less reduction of pain. (abstract only)

**Long A, May S, Fung T, Specific directional exercises for patients with low back pain: a case series. *Physio Canada, 60.307-317,* 2008**

Further analysis from previous trial (Long et al 2004), in which patients (N = 96) who were worse, unchanged or wanted additional treatment at the end of the 2-weeks original trial were offered alternate directional preference exercises for 2 weeks. Outcomes were analysed after the original 2-week period (unmatched treatment) and then between 2 and 4 weeks (matched directional preference treatment). A few minor clinically unimportant changes became statistically and clinically important across all outcomes when patients received treatment that matched their directional preference.

**Machado LAC, Maher CG, Herbert RD, Clare H, McAuley JH, The effectiveness of the McKenzie method in addition to first-line care for acute low back pain: a randomized controlled trial. *BMC Med, 8:10,* 2010**

Comparison of trained GP care (advice, reassurance, and paracetamol) with trained GP care plus McKenzie care delivered by therapists with credentialed qualification over 3 weeks. There were significant differences favouring the McKenzie group in pain over the first few weeks, though these differences were clinically small, but there were no significant differences in perceived effect, function or persistent symptoms. Patients in the McKenzie group sought significantly less additional care.

 

**Manca A, Dumville JC, Torgerson DJ, Klaber Moffett JA, Mooney MP, Jackson DA, Eaton S, Randomized trial of two physiotherapy interventions for primary care back and neck pain patients: cost-effectiveness analysis. *Rheumatology, 46:1495-15010,* 2007**

This was an economic analysis of the Klaber-Moffett et al (2007) trial. Despite a mean of one additional visit in the McKenzie group and being more expensive the McKenzie group had additional benefit and was deemed to be cost-effective in regard to acquiring additional Quality Adjusted Life Years.

**Matsudaira K, Hiroe M, Kikkawa M, Sawada T, Suzuki M, Isomura T, Oka H, Hiroe K, Hiroe K., Can standing back extension exercise improve or prevent low back pain in Japanese care workers? *J Man Manip Ther, DOI 10.11729/2042618614Y,* 2015**

64 care workers received an exercise manual and advice to do extension in standing exercise on a regular basis, especially after lifting or being flexed for long periods; workers in the control group (N = 72) were only given the manual; there were no baseline differences in the two groups. In the intervention group 43% reported subjective improvement in back pain, compared to 15% in the control group (p=0.003); in the intervention group 83% reported compliance with the exercise, compared to 9% in the control group.

**Mbada C, Ayanniyi O, Ogunlade S, Comparative efficacy of three active treatment modules on psychosocial variables in patients with long-term mechanical low- back pain: a randomized-controlled trial. *Archives of Physiotherapy, 5,10,* 2015**

This randomised controlled trial looked at 'McKenzie Protocol'(extension only) alone and in combination with strengthening on psychosocial outcomes. At 4 and 8 weeks all groups demonstrated significant improvements on all measures of beliefs and fear avoidance.

**Mbada C, Ayanniyi O, Ogunlade S, Rehabilitation of Back Extensor Muscles' Inhibition in Patients with Long-Term Mechanical Low-Back Pain.** *ISRN Rehabilitation, 928956,* **2013**

This RCT with 84 patients with LBP compared 3 treatment groups; 'McKenzie Protocol' (extension exercises), McKenzie + static back endurance exercises and McKenzie + dynamic back extensor exercises at 4 and 8 weeks. Physical performance tests, including static and dynamic endurance, were used as the outcome. The 'McKenzie Protocol' alone or in combination with the other exercises were effective in improving muscular endurance

**Mbada CE, Ayanniyi O, Ogunlade SO, Orimolade EA, Oladiran AB, Ogundele AO., Rehabilitation of back extensor muscles inhibition in patients with long-term mechanical low-back pain. *Rehabilitation, 2013: 928956,* 2013**

84 patients randomised to 3 groups all receiving an MDT protocol; in addition 2 groups received static back endurance exercises or dynamic endurance exercises as well; same trial as above. The outcomes only related to muscle endurance and muscle fatigue, with no recording of pain or function. All groups showed significant improvements in endurance and fatigue, but the MDT plus dynamic endurance exercise group showed significantly better outcomes at 4 and 8 weeks.

**Mbada CE, Ayanniyi O, Ogunlade SO., Effect of static and dynamic back extensor muscles endurance exercise on pain intensity, activity limitation and participation restriction in patients with long-term mechanical low-back pain. *Med Rehab, 15:11-20,* 2011**

84 patients randomised to 3 groups all receiving an MDT protocol; in addition 2 groups received static back endurance exercises or dynamic endurance exercises as well;

 

same trial as below. The outcomes related to pain, back-pain related disability using Roland-Morris and Oswestry questionnaires. There were significant differences in all groups at 4 and 8 weeks. There were no significant differences between groups in pain and Oswestry at any time point, but there was a significant difference favouring the McKenzie group plus dynamic back endurance exercises in Roland-Morris at 4 weeks only. However this difference was less than 1 /24 and of negligible clinical significance.

**Mihaela O, Mihaela C, McKenzie training in patients with early stages of ankylosing spondylitis (AS): results of a 24-week controlled study. *Euro J Phys Rehab Med, in press,* 2015**

52 patients with early lumbar AS were randomly assigned to McKenzie training or classic kinetic exercises and a number of functional and movement outcomes were registered at baseline, 12, and 24 weeks. There were significant differences in both groups, more in the McKenzie group; but there were significant differences in all groups that favoured the McKenzie group (p=0.001).

**Moffett JK, Jackson DA, Gardiner ED et al, Randomized trial of two physiotherapy interventions for primary care neck and back pain patients: 'McKenzie' vs brief physiotherapy pain management. *Rheumatology, Dec;45:1514-1521,* 2006**

315 patients (219 with back pain 96 with neck pain) were randomised to either: McKenzie approach or a cognitive behavioural approach and were followed for 12 months, with the main outcome being the Tampa Scale of Kinesiophobia (TSK). Both groups reported modest but clinically important functional improvements, but there were few differences between the groups. Except greater TSK Activity-Avoidance improvement at 6 months and greater satisfaction in the McKenzie group; and greater change in one aspect of Health Locus of Control measure in the cognitive behavioural approach plus The Back or Neck Book.

**Murtezani A, Govori V, Meka V, Rrecaj S, Gashi S, A comparison of McKenzie therapy with electrophysical agents for the treatment of work related low back pain: A randomized controlled trial, *J Back Musculoslelet Rehabil, 28(2):247-53.,* 2015**

This RCT on chronic LBP patients randomised to a McKenzie and a electrophysical agents group. Results at 3 months showed greater improvements in the McKenzie group.

**Olusola A, Arinola S, Olusegun O, Effects of the McKenzie protocol on pregnancy-related back pain. *Journal of Experimental and Integrative Medicine, 6,3,* 2016**

This RCT recruited 466 pregnant women with back pain and randomised them into a McKenzie group plus usual care and a usual care group. The participants were treated over 6 weeks and there was a low drop out rate. The McKenzie group had significantly less back pain and disability. The McKenzie Method was recommended in the management of pregnancy related back pain.

**Paatelma M, Kilpikoski S, Simonen R, Heinonen A, Alen M, Videman T, Orthopaedic manual therapy, McKenzie method or advice only for low back pain in working adults: a randomized controlled trial with 1 year follow-up. *J Rehabil Med, Nov;40(10):858-63,* 2008**

134 recruits were randomised to one of 3 treatment arms and outcomes were gathered at baseline and 3, 6 and 12 months. All groups improved significantly at 3 months, but there were no significant differences between groups. At 6 and 12 months there were significant differences favouring the McKenzie group over the advice only group. There were no significant differences between the McKenzie and orthopaedic manual therapy group at any point.

**Petersen T, Kryger P, Ekdahl C, Olsen S, Jacobsen S., The effect of McKenzie therapy as compared with that of intensive strengthening training for the treatment of patients with subacute or chronic low back pain: A randomized controlled trial. *Spine, Aug 15;27(16):1702-9,* 2001**

260 patients with chronic back pain followed up at 2 and 8 months after 8 week treatment period. With intention to treat analysis both groups improved modestly, McKenzie group favoured at 2 months. Outcomes were better and differences favouring McKenzie group were more significant in those who actually completed treatment.

**Petersen T, Larsen K, Jacobsen S, One-year follow-up comparison of the effectiveness of McKenzie treatment and strength training for patients with chronic low back pain. *Spine, 32.2948-2956,* 2007**

Long-term follow up of previous trial showing no significant differences between groups and examined factors associated with good and bad outcomes.

**Petersen T, Larsen K, Nordsteen J, Olsen S, Fournier G, Jacobsen S, The McKenzie method compared with manipulation when used adjunctive to information and advice in low back pain patients presenting with centralisation or peripheralisation. A randomised controlled trial. *Spine, 36.1999-2010,* 2011**

574 patients were screened and 53% demonstrated centralisation, and 7% peripheralisation. These 350 patients with back pain for at least 6 weeks were randomised to MDT or chiropractic manipulation. Both groups improved, but there were significant differences that favoured the MDT group in terms of numbers reporting success after treatment, and disability at 2 and 12 months.

**Schenk R, Dionne C, Simon C, Johnson R, Effectiveness of mechanical diagnosis and therapy in patients with back pain who meet a clinical prediction rule for spinal manipulation., *J Man Manip Ther, 20:(1):43-9,* 2012**

31 patients who met at least 3 out of 5 of the clinical prediction rules for improvement with manipulation were randomised to receive either manipulation or MDT management. At 4 weeks there were significant improvements in both groups, but no significant differences between groups.

**Schenk R, Jozefczyk, Kopf A, A randomised trial comparing interventions in patients with lumbar posterior derangement. *J Man & Manip Ther, 11:95-102,* 2003**

25 patients with lumbar radiculopathy classified as derangement then randomised to McKenzie or mobilisation therapy. Significantly better outcomes pain and function for McKenzie group short-term.

**Schenk R, Lawrence H, Lorenzetti J, Marshall W, Whelan G, Zeiss R., The relationship between Quebec Task Force Classification and outcome in patients with low back pain treated through mechanical diagnosis and therapy. *J Man Manip Ther, DOI 10.11729/2042618614Y,* 2015**

49 patients were treated with mechanical diagnosis and therapy and were assessed with FOTO function score at baseline, at two weeks and at discharge. Mean FOTO scores improved from 49 points to 68, indicating improvement, in a mean of eight treatment sessions. There was no correlation between QTFC and change in FOTO, except there was a significant difference based on acuity (p=0.003), with patients with chronic pain less likely to improve.

 

**Sheeran L, van Deursen R, Catterson B, Sparkes V., Classification-guided versus generalized postural intervention in subgroups of nonspecific chronic low back pain. *Spine, 38:1613-1625,* 2013**

29 patients with chronic low back pain with flexion pattern (made worse with flexion and better with extension) and 20 with extension pattern (made worse by extension and better with flexion) were randomised to a classification based treatment approach or a generalised postural intervention. The classification based treatment produced significantly better outcomes in pain and function at short-term.

**Snook SH, Webster BS, McGorry RW, The reduction of chronic, non-specific low back pain through the control of early morning lumbar flexion: 3-year follow-up. *J Occup Rehab, 12.13-19,* 2002**

3-year follow-up of previous study with 62% of subjects still restricting bending activities in the early morning and claiming benefit.

**Snook SH, Webster BS, McGorry RW, Fogleman MT, McCann KB, The reduction of chronic nonspecific low back pain through the control of early morning lumbar flexion. A randomized controlled trial. *Spine, Dec 1;23(23):2601-7,* 1997**

Education in the control of early morning flexion produced significant reductions in pain intensity, days in pain, disability and medication use. High drop-out rates show the difficulty of getting people to make such behavioural changes.

**Spratt KF, Weinstein JN, Lehmann TR, Woody J, Sayre H, Efficacy of flexion and extension treatments incorporating braces for low-back pain patients with retrodisplacement, spondylolisthesis, or normal sagittal translation. *Spine, 18(13):1839-1849,* 1992**

Improvement in the extension group was significantly greater, regardless of type of radiographic abnormality, than flexion or control group.

**Stankovic R, Johnell O, Conservative treatment of acute low back pain. A 5-year follow-up study of two methods of treatment. *Spine, 20(4):469-472,* 1994**

Difference between 2 treatments at 5 years was much less, however McKenzie group had significantly less recurrences of pain and episodes of sick leave.

**Stankovic R, Johnell O., Conservative treatment of acute low-back pain. A prospective randomized trial: McKenzie method of treatment versus patient education in "mini back school". *Spine, Feb;15(2):120-3,* 1989**

100 acute back patients randomised to McKenzie or back school; significantly better outcomes in McKenzie group in pain, function, sick leave, recurrences, and further health care.

**Surkitt L, Ford J, Chan A, Richards M, Slater S, Pizzari T, Hahne A, Effects of individualised directional preference management versus advice for reducible discogenic pain A pre-planned secondary analysis of a randomised controlled trial. *Manual Therapy, 25, 69-80,* 2016**

This was a secondary analysis from a multicenter RCT looking at directional preference management versus advice for ‘reducible discogenic pain’. Directional preference management was significantly better at pain reduction and other outcomes up to 10 weeks, but improvements were not sustained. Satisfaction with care was significantly better in the directional preference group up to 52 weeks.

 

**Surkitt, L, Ford J, Chan A, Richards M, Slater S, Pizzari T, Hahne A, Effects of Individualised Directional Preference Management Versus Advice For Reducible Discogenic Pain: A Pre-Planned Secondary Analysis of A Randomised Controlled Trial.** ***Manual Therapy, 25, 69-80,*** **2016**

This was a secondary analysis of an RCT comparing directional preference management to guideline based advice for LBP. It looked at a 'reducible discogenic subgroup' and found significantly less back and leg pain in the directional preference group at 10 weeks, but not at 26 or 52 weeks. There was no difference in functional outcomes, but significantly more DP patients reached the threshold for clinical meaningful improvement at 52 weeks.

**Udermann BE, Mayer JM, Donelson RG, Graves JE, Murray SR, Combining lumbar extension training with McKenzie therapy: effects on pain, disability, and psychosocial functioning in chronic low back pain patients.** ***Gundersen Lutheran Med J, 3:7-12,*** **2004**

18 patients received McKenzie therapy or McKenzie plus resistance training. There were no significant difference between groups at 4 weeks, but strength, endurance, range of movement and quality of life measures on the SF36 had significantly improved in both groups.

**Udermann BE, Spratt KF, Donelson RG, Mayer J, Graves JE, Tillotson J, Can a patient educational book change behavior and reduce pain in chronic back pain patients?** ***Spine J, 4.425-435,*** **2004**

Long-term (18 month) uncontrolled cohort study of effect of TYOB on 48 of 62 chronic back pain volunteers. There were significant differences in reductions in pain and pain episodes and perceived benefit over time. Significant differences remained even with a worst-case model to account for those lost to follow-up. Compliance with exercise and posture advice was reported by about 80% long-term.

## CENTRALISATION- LUMBAR & CERVICAL (selected; more on MII website reference list)

**Aina A, May S, Clare H, The centralization phenomenon of spinal symptoms - a systematic review.** ***Man Ther, Aug;9(3):134-143,*** **2004**

Systematic review of 14 studies into centralisation. Prevalence 70% in 731 sub-acute back pain patients and 52% in 325 chronic back pain patients. Centralisation was reliably assessed (kappa values 0.51 to 1.0). Centralisation was consistently associated with good outcomes, and failure to centralise with poor outcomes. Association was confirmed by high quality studies.

**Al-Obaidi SM, Al-Sayegh NA, Nakhi HB, Skaria N., Effectiveness of McKenzie intervention in chronic low back pain: a comparison based on the centralization phenomenon utilizing selected bio-behavioral and physical measures.** ***Int J Phys Med & Rehab, 1:4,*** **2013**

Comparison of outcomes in 2 groups of patients with chronic low back pain who demonstrate complete (N =62) or partial centralization (N=43), and followed-up over 10 weeks with treatment with MDT. The groups were significantly different at baseline in terms of fear-avoidance and Roland-Morris Back Disability questionnaire. Over time both groups had highly significant changes in all outcomes relating to pain perception, fear beliefs, disability beliefs and physical performance tests, but were better in the full centralization group.

**Albert HB, Hauge E, Manniche C., Centralization in patients with sciatica: are pain responses to repeated movement and positioning associated with outcome or types of disc lesions? *Eur Spine J, 21(4):630-6,* 2012**

Secondary analysis of previous RCT; 176 patients with sciatica and pain below the knee given a mechanical assessment and classified: 85% reported centralization, 7% peripheralization, and 8% no effect in response to repeated movements. Leg pain was significantly better in the centralization and peripheralization groups at 3 and 12 months. Centralization occurred in all types of disc lesions reported on MRIs, from normal through to sequestrations.

**Bonnet F, Monnet S, Otero J, Short-term effects of a treatment according to the directional preference of low back pain patients: a randomized clinical trial. *Kinesither Rev, 112.51-59,* 2011**

54 patients were randomly allocated to McKenzie method or guideline-based treatment, and final assessments were taken at the end of one week. There were significant differences in centralisation in the McKenzie group (62% versus 17%), but no difference in other outcomes (Oswestry and pain intensity) (In French).

**Broez D, Burkard S, Weller M, A prospective study of mechanical physiotherapy for lumbar disk prolapse: five year follow-up and final report. *NeuroRehab, 26.155-158,* 2010**

Follow-up of previous study in which patients with lumbar herniations and demonstrating centralisation predicted good long-term outcome in the majority of patients.

**Bybee F, Olsen D, Cantu-Boncser G, Condie Allen H, and Byars A, Centralization of symptoms and lumbar range of motion in patients with low back pain. *Physio Theory Pract, 25:257-267,* 2009**

42 patients with back pain were classified as centralised (30), centralising (3), non-centralised (9); there were significant differences between initial and final extension range in first 2 groups, but not in the latter. Patients who showed centralisation on initial visit also showed an increase of ROM during initial visit.

**Christiansen D, Larsen K, Jensen OK, Nielsen CV, Pain Responses in Repeated End-Range Spinal Movements and Psychological Factors in Sick-Listed Patients with Low Back Pain: is there an Association? *J Rehabil Med, 41.545-549,* 2009**

Cross sectional study looking at centralisation status and psychological factors in 331 patients with back pain. Centralisation occurred in 30% of their sample. There were significant associations between non-centralisation and mental distress and depression.

**Christiansen D, Larsen K, Jensen OK, Nielsen CV., Pain response classification does not predict long-term outcome in sick listed low back pain patients., *J Orthop Sports Phys Ther, 40:606-615,* 2010**

A cohort study running alongside a RCT of over 300 patients who were sick-listed for back pain and assessed for the presence of centralisation; with primary outcome being return to work. Following mechanical evaluation 30% were classified as centralisers, 8% as peripheralisers, and 62% as no response. All groups improved over the year, with no significant differences between pain response groups.

**Donelson R, Aprill C, Medcalf R, Grant W., A prospective study of centralization of lumbar and referred pain. A predictor of symptomatic discs and annular competence. *Spine, May 15;22(10):1115-22,* 1996**

63 chronic patients received a mechanical evaluation and discography, with clinicians blind to the findings of the other assessment. Centralisation (74%) and

 

peripheralisation (69%) were strongly associated with discogenic pain, compared to no change in symptoms (12%). Centralisation (91%) was strongly associated with a competent annulus compared to peripheralisation (54%).

**Donelson R, Grant W, Kamps C, Medcalf R., Pain response to sagittal end-range spinal motion. A prospective, randomized, multicentered trial. *Spine, Jun;16(6 Suppl) : S206-12,* 1990**

Donelson found that 47% of low back pain patients with or without referred pain displayed a directional preference to end range sagittal spinal movement 40% preferred extension, 7% preferred flexion.

**Donelson R, Silva G, Murphy K., Centralization phenomenon. Its usefulness in evaluating and treating referred pain. *Spine, Mar;15(3):211-3,* 1989**

The centralisation phenomenon is found to be a reliable predictor of good or excellent treatment outcome. In 87 patients centralisation occurred in 87% - with centralisation occurring in 100% of 59 patients with excellent outcomes.

**Edmond SL, Cutrone G, Werneke M, Ward J, Grigsby D, Weinberg J, Oswald W, Oliver D, McGill T, Hart DL., Association between centralization and directional preference; and functional and pain outcomes in patients with neck pain. *J Orth Sports Phys Ther, 44(2):68-75,* 2014**

304 patients with neck pain were included, and prevalence rates of 40% for centralization and 70% for directional prevalence were recorded. Neither were associated with pain outcomes, but directional preference and to a lesser extent, centralization, were associated with improvements in function. Younger subjects were more likely to centralize, and those with acute symptoms more likely to demonstrate directional preference.

**Edmond SL, Werneke MW, Hart DL., Association between centralization, depression, somatization, and disability among patients with nonspecific low back pain. *J Orthop Sports Phys Ther, 40:801-810,* 2010**

Secondary analysis of cohort study of 231 patients with back pain in which data was gathered about depression, somatization, and centralization at baseline, and measures of disability and pain at baseline and follow-up. Associations between depression and somatizisation and chronic disability were reduced in the presence of centralization.

**George SZ, Bialosky JE, Donald DA, The centralization phenomenon and fear-avoidance beliefs as prognostic factors for acute low back pain: a preliminary investigation involving patients classified for specific exercise. *J Orthop Sports Phys Ther, 35:580-588,* 2005**

Secondary analysis of 28 patients who were classified as specific exercise category and observed for the effects of prognostic variables at baseline on outcomes at 6 months. Centralisation and fear-avoidance at work both independently and significantly predicted disability at 6 months. Only centralisation significantly predicted pain at 6 months.

**Hagovska M, Takac P, Petrovicova J., Changes in the muscle tension of erector spinae after the application of the McKenzie method in patients with chronic low back pain. *Phys Med Rehab Kuror, 24:133-140,* 2014**

Comparison of muscle activity in centralizers and healthy controls, with the latter showing significantly lower erector spinae activity. Following centralization pain, disability, and erector spinae were all reduced.

**Karas, R.; McIntosh, G.; Hall, H.; Wilson, L.; Melles, T., The Relationship Between Nonorganic Signs and Centralization of Symptoms in the Prediction of Return to Work for Patients With Low Back Pain, *Phys Ther, 77:354-360,* 1996**

Inability to centralize indicated a decreased probability of returning to work, regardless of the Waddell score. A high Waddell score predicted a poor chance of returning to work regardless of the patients ability to centralize symptoms. Waddell scores appear to be a better predictor of poor outcomes.

**Kilpikoski S, Alen M, Paatelma M, Simonen R, Heinonen A, Videman T, Outcome comparison among working adults with centralizing low back pain: secondary analysis of a randomized controlled trial with 1-year follow-up., *Advances in Physio, 11:210-217,* 2009**

Secondary analysis looking at outcomes in a group of patient with centralisation randomised to McKenzie, orthopaedic manual therapy (OMT) or advice to stay active. The McKenzie group had some significantly better outcomes after treatment and at 3 and 6 months than the advice group, but at one year there were no significant differences between the groups. There were few significant differences between the 2 active treatments (McKenzie group less leg pain at 3 months) or between OMT and the advice only group (OMT group less back and leg pain at 6 months).

**Kilpikoski S, Alen M, Simonen R, Heinonen A, Videman T., Does centralizing pain on the initial visit predict outcomes among adults with low back pain? *Manuelle therapie, 14:136-141,* 2010**

Secondary analysis of previous RCT (Paatelma et al. 2008) in which baseline centralizers (N=119) were compared to baseline non-centralizers (N=15) during follow-up. Centralizers had a significantly greater reduction in pain and disability immediately after the treatment period; and at 6 months for pain only. (In German)

**Laslett M, Oberg B, Aprill CN, McDonald B, Centralization as a predictor of provocation discography results in chronic low back pain, and the influence of disability and distress on diagnostic power. *Spine J, 5:370-380,* 2005**

83 patients with chronic low back pain underwent a full or partial mechanical examination and discography and the results were compared. The prevalence of positive discography was 75%, and of centralisation 32%. Sensitivity of centralisation to predict discogenic pain was weak (about 40%), but specificity was high and 100% in patients without severe distress or disability.

**Long A, The centralization phenomenon: its usefulness as a predictor of outcome in conservative treatment of chronic low back pain (a pilot study), *Spine, 20(23):2513-2521,* 1995**

A pilot study indicating that centralisation is useful as an outcome predictor in chronic patients. There was a superior outcome comparing centralisers to non-centralisers in an interdisciplinary work-hardening programme.

**Long A, May S, Fung T, The comparative prognostic value of directional preference and centralization: a useful tool for front-line clinicians? *J Manual Manip Thera, 16.248-254,* 2008**

Secondary analysis from a previous trial (Long et al 2004) of 312 patients who received a mechanical evaluation at baseline, 84 were deemed to have a good outcome (defined as at least 30% reduction in baseline Roland-Morris score). Factors that were predictive of a good outcome were analysed using multivariate analysis. Only leg bothersomeness rating and treatment assignment survived multivariate analysis. Subjects with directional preference who received matched directional

 

treatment were 7.8 times more likely to have a good outcome, which was a stronger predictor than a range of other biopsychosocial factors.

**May S, Aina A, Centralization and directional preference: a systematic review. *Manual Therapy, 17:497-506,* 2012**

The review included 54 studies relating to centralization and 8 relating to directional preference exercises. The prevalence on centralization was 44% in back and neck pain, with higher prevalence in acute (74%) than sub-acute or chronic symptoms (42%). Twenty-one of 23 studies supported the prognostic validity of centralization, whereas 2 did not. Centralization and directional preference appear to be useful treatment effect modifiers in 7 of 8 studies. Levels of reliability were very varied (kappa 0.15-0.9).

**Murphy DR, Hurwitz EL, Application of a diagnosis-based clinical decision guide in patients with low back pain. *Chiro Man Ther, 19:26,* 2011**

Assessment of 264 consecutive patients using previously described algorithm found that 2.7% had serious pathology and 41% showed centralization. According to definitions used 23% / 27% / 24% showed lumbar, sacroiliac segmental signs (pain provocation tests) and radicular signs respectively. In 63% and 40% dynamic instability and fear beliefs were respectively diagnosed.

**Murphy DR, Hurwitz EL, Application of a diagnosis-based clinical decision guide in patients with neck pain. *Chiro & Man Ther, 19:19,* 2012**

Data on 95 patients with neck pain on their classification according to the diagnosis-based clinical decision guideline previously published. Potential serious illness was found in 1%, centralization in 27%, segmental pain provocation signs in 69%, and radicular signs in 19%.

**Murphy DR, Hurwitz EL, McGovern EE., A nonsurgical approach to the management of patients with lumbar radiculopathy secondary to herniated disk: a prospective observational cohort study with follow-up. *J Manip Physiol Thera, 32.723-733,* 2009**

Report on consecutive cohort study of patients with lumbar radiculopathy of who 62% demonstrated centralisation with repeated movements, and 8% peripheralisation. Centralisation was associated with functional improvement, especially at long-term follow-up.

**Otero J, Bonnet F, Low back pain: prevalence of McKenzie's syndromes and directional preference. *Kinesither Rev, 14:36-44,* 2014**

66 French certified McKenzie therapists each collected data on 10 consecutive patients, providing data on 349 patients with back pain. At baseline 92% were classified with Derangement, 2.3% with Dysfunction, 0.9% with Postural, and 4.9% with Other. Centralization was recorded in 70.5% at baseline, which increased to 73.5%, and Directional Preference remained at 73.5%. Between baseline and the fifth session the classification remained the same in 90.1%. Directional preference was as follows: extension 79.5%, lateral 12.6%, and flexion 4.3%.

**Skytte L, May S, Petersen P, Centralization: Its prognostic value in patients with referred symptoms and sciatica, *Spine, 30:E293-E299,* 2005**

60 patients with referred symptoms and sciatica following a mechanical evaluation were classified as centralisers (25) or non-centralisers (35). Patients then followed a standardised management pathway that involved surgery if there was a failure to improve. Both short and long-term the centralisation group had significantly better outcomes for pain and disability. Non-centralisers were 6 times more likely to have surgery.

 

**Sufka A, Hauger B, Trenary M, Bishop B, Hagen A, Lozon R, Martens B., Centralization of low back pain and perceived functional outcome., *J Orthop Sports Phys Ther, Mar;27(3):205-12,* 1998**

Of 36 patients 70% centralised within 14-day test period centralisation was less amongst those with chronic symptoms and those with more referred pain. Centralisation was associated with significantly more improvement on one of the functional outcome measures used.

**Werneke M, Hart DL, Cook D, A descriptive study of the centralization phenomenon. A prospective analysis., *Spine, Apr 1;24(7):676-83,* 1998**

Of 289 patients with acute neck and back pain 31% centralised during repeated movement testing in the clinic and achieved abolition of symptoms on an average of 4 sessions; 46% showed some centralisation or reduction of symptoms on an average of 8 sessions (partial response); 23% showed no change in symptom site or intensity over an average of 8 sessions. The authors question whether in the partial response group changes were a product of the natural history or exercise programme. Both centralisers and partial responders showed significant improvement in pain intensity and function, whilst the non-response group did not. Assessment of initial pain location was reliably assessed.

**Werneke M, Hart DL, Resnik L, Stratford PW, Reyes A, Centralization: prevalence and effect on treatment outcomes using a standardized operational definition and measurement method. *J Orthop Sports Phys Ther, 38:116-125,* 2008**

Report of over 350 spine patients; 76% lumbar, 53% chronic symptoms (> 3 months), mean age 58 years. Overall rate of centralization at intake as measured on a body chart template was 17%, with higher rates in more acute and younger patients. For instance rates were 29% and 24% for acute (< 3 weeks) lumbar and cervical patients, and 32% and 30% for lumbar and cervical patients aged between 18 and 44. Centralization was much less common in those with chronic symptoms and those over 64 for lumbar problems and over 44 for those with cervical problems. Outcomes were better amongst centralizers and outcomes were worse amongst non-centralizers.

**Werneke M, Hart DL., Centralization phenomenon as a prognostic factor for chronic low back pain and disability. *Spine, Apr 1;26(7):758-65,* 2000**

In 225 patients with acute back pain 24 psychosocial, somatic and demographic variables were recorded at initial assessment. Patient outcomes at one year were predicted by a range of independent variables. When all these variables were entered in a multivariate analysis only pain pattern classification (centralisation or partial centralisation v non-centralisation), and leg pain at intake were significant predictors of chronic pain and disability.

**Werneke M, Hart DL., Discriminant validity and relative precision for classifying patients with non-specific neck and back pain by anatomical pain patterns. *Spine, 28(2), 161-166,* 2002**

Re-analysis of data from earlier study comparing prognostic usefulness of classifying patients as centralisers on the first visit compared to during subsequent visits. At first visit 130 (45%) were classified as centralisers, only 4 became non-centralisers, but 43 became partial centralisers. At first visit 157 (55%) were classified as non-centralisers _x0013_ of these 95 (60%) became partial or full centralisers at later sessions.

**Werneke MW, Hart D, Oliver D, McGill T, Grigsby D, Ward J, Weinberg J, Oswald W, Cutrone G., Prevalence of classification methods for patients with lumbar impairments using the McKenzie syndromes, pain pattern, manipulation and stabilization clinical prediction rules., *J Man Manip Ther, 18:197-210,* 2010**

Data collected on 628 patients from 8 different clinics by therapists with training in MDT found prevalence of derangement (67%), dysfunction (5%), and posture syndrome (0%); centralisation (43%), non-centralisation (39%), and not classified (18%); and positive to manipulation (13%) and stabilisation (7%) clinical prediction rules. Derangement classification and centralisation prevalence was high in patients who fulfilled both clinical prediction rules.

**Werneke MW, Hart DL, George SZ, Deutscher D, Stratford PW., Change in psychosocial distress associated with pain and functional status outcomes in patients with lumbar impairments referred to physical therapy services., *J Orth Sports Phys Ther, 41:969-980,* 2012**

Re-analysis of data from 586 patients with back pain; patients who demonstrated non-centralization (37%) had significantly worse pain, functional disability and psychosocial distress outcomes compared to those who centralized (45%). No pain pattern classification was recorded in 18%.

**Werneke MW, Hart DL, George SZ, Stratford PW, Matheson JW, Reyes A, Clinical outcomes for patients classified by fear-avoidance beliefs and centralization phenomenon. *Arch Phys Med Rehab, 90:768-777,* 2009**

Secondary analysis looking at predictors of outcome in 238 patients with back pain: 18% centralisers, 52% non-centralisers, and 30% could not be classified; 56% had low fear avoidance, 44% had high fear avoidance. Treatments depended on classification according to these variables. Patients who demonstrated centralisation improved most whatever their levels of fear avoidance; those with high levels of fear avoidance improved least. Both centralisation and fear-avoidance levels impacted on outcomes.

**Werneke MW, Hart DL., Centralization: association between repeated end-range pain responses and behavioral signs in patients with acute non-specific low back pain. *J Rehabil Med, Sep;37(5):286-90,* 2005**

Re-analysis of data from previous study to determine association between centralisation category and psychosocial variables. Non-centralisation patients were significantly more likely to have positive non-organic signs, overt pain behaviour, fear of work activities and somatisation, but no difference was found between centralisation category regarding depression, fear of physical activity, disability or pain intensity.

**Werneke MW, Hart DL., Categorizing patients with occupational low back pain by use of the Quebec Task Force Classification system versus pain pattern classification procedures: discriminant and predictive validity. *Phys Ther, Mar;84(3):243-54,* 2004**

Re-analysis of previously collected data comparing different methods of classifying back pain patients for their ability to predict outcome. QTF 3 or 4 predicted high levels of pain and disability at intake, but only centralisation / non-centralisation categories predicted pain and disability at discharge. Non-centralisation was stronger predictor of work status at 1 year than fear-avoidance. Predictive value of centralisation / non-centralisation stronger when followed through rehabilitation period, than just at intake.

**Williams MM, Hawley JA, McKenzie RA, van Wijmen PM., A comparison of the effects of two sitting postures on back and referred pain. *Spine, Oct;16(10):1185-91,* 1990**

Over a 24-48 hour period 2 groups of patients with back and referred pain were encouraged to sit in lordosis or in a kyphotic posture. Lordotic sitting group had back and leg pain significantly reduced and pain centralised compared to kyphotic group.

## OBSERVATIONAL STUDIES (selected; more on MII website reference list)

**Apeldoorn A, van Helvoirt H, Meihuizen H, Tempelman H, Vandeput D, Knol D, Kamper S, Ostelo R, The influence of centralization and directional preference on spinal control in patients with nonspecific low back pain. *J Orth Sports Phys Ther, 46(4):258-69,* 2016**

This study explored whether clinical signs of impaired spinal control changed in relation to the outcome of an MDT assessment, it used a test-retest design. Of those patients that centralised 43% and 50% showed improvement in aberrant movements and ASLR respectively. Only < 10% improved in the non directional preference group. Clinical signs of poor motor control can be reduced spontaneously following an MDT assessment.

**Deutscher D, Werneke M, Gottlieb D, Fritz, J, Resnik L, Physical Therapists' level of McKenzie education, functional outcomes, and utilization in patients with LBP, *JOSPT, 44:12:925936,* 2014**

The study looked at the associations between Mckenzie training, functional status at discharge and number of visits for LBP patients. 20,882 patients were treated and discharged in this observational cohort study. Patients treated by McKenzie therapists had better outcomes and fewer visits compared to those treated by other therapists. This suggests improved cost-effectiveness of advanced MDT training levels.

**Elden H, Gutke A, Kjellby-Wendt G, Fagevik-Olsen M, Ostgaard H, Predictors and consequences of long-term pregnancy-related pelvic girdle pain: a longitudinal follow-up study, *BMC Musculoskeletal Dis, 17:276,* 2016**

The longitudinal study looked at the predictors of those women who would have long term pelvic girdle pain following pregnancy. MDT was used in combination with SIJ tests for classification.

**Elenburg JL, Foley BS, Roberts K, Bayliss AJ., Utilization of mechanical diagnosis and therapy (MDT) for the treatment of lumbar pain in the presence of known lumbar transverse process fractures: a case study., *J Man Manip Ther, DOI 10.11729/2042618614Y,* 2015**

Case report of a 24-year old woman with multiple transverse process fractures sustained 10-weeks earlier as a pedestrian in a motor vehicle accident who was classified as a derangement. She demonstrated considerable improvement with a change in Oswestry function score from 22% to 6% from initial presentation to discharge.

**Hammer C, Degerfeldt L, Denison E, Mechanical diagnosis and therapy in back pain: compliance and social cognitive theory. *Advances in Physio, 9.190-197,* 2007**

Study of 58 patients being treated with MDT that examined self-efficacy and compliance. Self efficacy was rated high; compliance tended to decrease over time, but at 2 months was still 64%. Pain and disability decreased over 5 visits and remained minimal at 2-month follow-up.

 

**Hefford C, McKenzie classification of mechanical spinal pain: profile of syndromes and directions of preference. *Manual Therapy, 13.75-81,* 2007**

Survey of over 300 consecutive patients with cervical, thoracic and lumbar pain from over 30 therapists, which describes mechanical classification, pain patterns and directional preference of reducible derangements. Over 90% were classified with a mechanical syndrome and more than 80% with derangement. Extension was the commonest directional preference by far, especially amongst patients with central or symmetrical symptoms, but also in over 50% of patients' symptoms in the arm or leg.

**Karayannis N, Jull G, Hodges P, Movement-based subgrouping in low back pain: synergy and divergence in approaches. *Physiotherapy, 102(2):159-69,* 2016**

This cross-sectional cohort study of low back pain patients aimed to explore the overlap between different classification systems (including MDT) in 102 participants. They concluded that there was 'overlap' and 'discordance' between the different approaches and proposed some means of future integration.

**Kopp JR, Alexander AH, Turocy RH, Levrini MG, Lichtman DM., The use of lumbar extension in the evaluation and treatment of patients with acute herniated nucleus pulposus. A preliminary report. *Clin Orthop, Jan;(202):211-8,* 1985**

67 patients with disc herniations and nerve root signs were given extension exercises. Of those who improved, 34/35 (97%) achieved full extension. 32 came to surgery, of which only 2 (6%) were able to extend. The ability to achieve full passive extension correlated with good response to conservative treatment, and this was mostly achieved in a few days. Sequestrations were found in 56% of those who came to surgery.

**May S, Classification by McKenzie mechanical syndromes: A survey of McKenzie-trained faculty. *J Manipulative Physiol Ther, Oct;29:637-642,* 2006**

Survey of 57 therapists in 18 countries and details of 607 consecutively discharged spinal patients and their mechanical syndrome classification. Individually each therapist recorded a mechanical classification in 82% of their patients, in total 83% of 607 patients had a mechanical classification - derangement 78%, dysfunction 3%, adherent nerve root (1%) and postural syndrome (1%). 'Other' was recorded in 17% of patients, most commonly mechanically inconclusive, chronic pain state and post-surgery.

**Mbada CE, Ayanniyi O, Ogunlade SO., Patterns of McKenzie syndromes and directional preference in patients with long-term mechanical low-back pain. *Romanian J Phys Ther, 19:62-68,* 2013**

89 patients with low back pain for at least 3 months were classified by credentialed therapists using a repeated movements McKenzie assessment and based on symptom response: 80%, 7%, and 13% were classified with derangement, dysfunction and postural syndrome respectively.

**McKenzie RA, A Prophylaxis in Recurrent Low Back Pain, *New Zealand Med J, No. 627, 89:22-23,* 1978**

Frequent restoration of the lumbar lordosis and avoidance of flexion were seen as critical factors in prophylactic education for prevention of recurrent LBP. McKenzie reports on 318 patients - onset, aggravating and relieving factors, deformity, and the success of treatment in reducing further attacks as reported by the patients.

**Melbye M, An adherent nerve root-Classification and exercise therapy in a patient diagnosed with lumbar disc prolapse. *Man Ther, 15:126-129,* 2010**

Case report of a patient diagnosed as lumbar disc prolapse who in fact responds to flexion repeated movements and for whom the real classification is adherent nerve root.

**Petersen T, Christensen R, Carsten J, Predicting a clinically important outcome in patients with low back pain following McKenzie therapy or spinal manipulation: a stratified analysis in a randomized controlled trial, *BMC Musculoskeletal Dis, 2015:16:74,***

An analysis of a previous RCT with 350 patients looked at any factors that predicted outcome. There were no predictors, Mckenzie Method was superior to manipulation across all subgroups. The two strongest predictors of success with MDT were nerve root involvement and peripheralisation.

**Peterson S, Hodges C, Lumbar lateral shift in a patient with interspinous device implantation: a case report, *J Man Manip Ther, 24(4):215-22,* 2016**

This case report describes the successful MDT management of a patient with a history of lumbar surgery and a lumbar lateral shift deformity.

**Rasmussen C, Nielsen GL, Hansen VK, Jensen OK, Schioettz-Christensen B, Rates of lumbar disc surgery before and after implementation of multidisciplinary nonsurgical spine clinics. *Spine, 30: 2469-2473.,* 2005**

In region in Denmark following introduction of spine clinics there was a significant decrease in spine surgery that was not found in the rest of Denmark during the same period. The clinics were based on Indahl and McKenzie principles and patients were treated by McKenzie trained physical therapists.

**Robinson M, Clinical diagnosis and treatment of a patient with low back pain using the patient response model: A case report. *Physiotherapy Theory and Practice, 32, 4, 315-323,* 2016**

This case report describes the successful classification and management of a patient with a Derangement and a directional preference of extension. Extension was performed in standing.

**Rohlmann A, Consmuller T, Dreischarf M, Bashkue M, Disch A, Pries E, Duda G, Schmidt K, Measurement of the number of lumbar spinal movements in the sagittal plane in a 24-hour period, *Eur Spine J, 23,2375-2384,* 2013**

This study used sensor strips on 208 non-symptomatic volunteers during daily living to measure sagittal spinal movements over 24 hrs. Volunteers spent much more time in flexion than extension, reaching full flexion 50 times and zero times reaching full extension. This study substantiates the previous data suggestions a great predominance of flexion in everyday life.

**Takasaki H, Mechanical Diagnosis and Therapy enhances attitude toward self-management in people with musculoskeletal disorders: A preliminary evidence with a before–after design. SAGE Open Medicine Volume 5: 1-9**

This study explored whether self-reported skills of self management for patients with musculoskeletal problems (primarily LBP) were affected by a 1 month course of MDT. Self-management and self-monitoring skills were enhanced.

 

**van Helvoirt H, Apeldoorn A, Knol D, Arts M, Kamper S, van Tulder M, Ostelo R, TFESIs influence MDT pain response classification in candidates for lumbar herniated disc surgery. *J Back and Musculo Rehab, 1, 1-9,* 2016**

This was a second analysis of prospective cohort data previously published which included 8 patients with symptoms less than 12 weeks. Results are similar to the previously published variation of the cohort. The discussion focuses on comparisons in the literature on the reported prognostic value of peripheralisation and centralisation.

**Van Helvoirt H, Apeldoorn AT, Ostelo RW, Knot DL, Arts MP, Kamper SJ, van Tulder MW, Transforaminal epidural steroid injections followed by Mechanical Diagnosis and Therapy to prevent surgery for lumbar disc herniation. *Pain Medicine, 15(7):1100-8,* 2014**

Patients were referred for surgery for disc herniation, confirmed by MRI with two or more neurological signs, after failed conservative care and no signs of centralization; 71 of 132 patients met these criteria. Patients received transforaminal epidural steroid injections (1-4) and then were re-evaluated by MDT clinicians. There were 2 drop outs, and the other patients were classified as follows: 11 resolved; 43 improved and pain now either centralizing or non-centralizing; 15 no improvement and no centralization and underwent surgery.

**Werneke M, Edmond S, Deutscher D, Ward J, Grigsby D, Young M, McGill T, McClenahan B, Weinberg J, Davidow A, Effect of adding McKenzie Syndrome, Centralization. *J Orth Sports Phys Ther, 46, 9, 726-741,* 2016**

This retrospective cohort study analysed the data from 723 lumbar patients. It looked at the value of adding certain MDT classification and psychosocial variables to a risk-adjusted model to see if they helped predict functional outcomes. These variables did not add significantly to the model. However, Diploma therapists achieved significantly better functional scores than non-diplomaed therapists and additional prognostic differences were found between MDT subgroups highlighting the potential for MDT clinicians to predict outcome dependent upon the patient's classification.

## SURVEYS OF PHYSICAL THERAPY PRACTICE (selected; more on MII website reference list)

**Battie MC, Cherkin DC, Dunn R, Clol MA, Wheller KJ., Managing Low Back Pain : Attitudes and Treatment Preferences of Physical Therapists. *Phys Ther, 74:3, 219-226,* 1993**

A survey of therapists in USA when presented with hypothetical back pain patients. The McKenzie method was deemed the most useful method of managing patients, and was said to be a very common means of evaluating patients.

**Bernhardsson S, Oberg B, Johansson K, Nilsen P, Larsson M, Clinical practice in line with evidence? A survey among primary care physiotherapists in western Sweden. *Journal of Evaluation in Clinical Practice, doi: 10.1111/jep.12380,* 2015**

271 Swedish physios completed a survey on preferred treatment interventions on 3 msk disorders. Their responses were compared to the current support of the evidence. Most interventions, including the use of MDT were supported by the evidence. However interventions with unclear or no evidence were also used to a high degree.

**Davies C, Nitz AJ, Mattacola CG, Kitzman P, Howell D, Viele K, Baxter D, Brockopp D., Practice patterns when treating patients with low back pain: a survey of physical therapists., *Physio Theory Pract, 30:399-408,* 2014**

250 physical therapists in Kentucky, USA were mailed the survey about the use of classification systems and outcome measures when treating patients with low back pain, and 120 (48%) responded. 73% reported using a classification system and 85% using outcome measures. The commonest classification systems were: McKenzie (61%), treatment-based approach (58%), movement impairment approach (21%), and other approached (16%). 86% reported that they learned the classification system as a post-graduate. The most common outcome measures were Oswestry, Numeric Pain Rating Scale, and Roland-Morris disability questionnaire.

**Foster NE, Thompson KA, Baxter GD, Allen JM, Management of nonspecific low back pain by physiotherapists in Britain and Ireland. A descriptive questionnaire of current clinical practice. *Spine, Jul 1;24(13):1332-42,* 1998**

The McKenzie method was said to be the second most common treatment approach used by therapists. The Maitland approach was used by 59%, McKenzie method by 47%, multiple other approaches were used as well with less frequency combined approaches were common.

**Gracey JH, McDonough SM, Baxter GD., Physiotherapy management of low back pain: a survey of current practice in Northern Ireland. *Spine, Feb 15;27(4):406-11,* 2001**

Details of management of over 1,000 patients by 157 therapists over 12-month period. McKenzie was used in over 70% of patients, usually in combination, and was one of the most commonly used approaches. McKenzie course attendees ranged from 76% for A to 16% for D.

**Hamm L, Mikkelsen B, Kuhr J, Stovring H, Munck A, Kragstrup J, Danish physiotherapists management of low back pain. *Advances in Physio, 5:109-113,* 2003**

An audit of 242 Danish PTs (14% of total) during a 4 week period to see if they used recommended treatments. McKenzie was used in 40% of consultations; there was a lot of combination of treatments; 22% of consultations involved non-recommended treatments, such as ultrasound and short-wave. McKenzie was most commonly used in acute back pain with radiation (64%), acute back pain (44%), chronic back pain with radiation (40%), and least in chronic back pain (27%).

**Miller-Spoto M, Gombatta SP., Diagnostic labels assigned to patients with orthopaedic conditions and the influences of the label on selection of interventions: a qualitative study of orthopaedic clinical specialists (OCS), *Phys Ther, 94:776-791,* 2014**

Case reports of 2 patients with back and shoulder pain were developed and sent to 877 board-certified OCS with 107 (12%) responding with sufficient data. The most common labels used were respectively: combination (49%) and pathology (33%); and pathology (57%) and combination (35%). The most common classification systems used for back pain case study were McKenzie (47%), pathoanatomic (18%), and treatment-based classification system (9%). The most common classification system used for shoulder case study was pathoanatomic (58%), with only 3% using the McKenzie classification. The classification systems used did not impact on the interventions used, which were most commonly some form of strengthening or stretching, or mobilisation of joints or soft tissues.

 

**Spoto MM, Collins J, Physiotherapy diagnosis in clinical practice: a survey of orthopaedic certified specialists. *Physio Res Int, 13.31-41,* 2008**

A survey of 850 physical therapists in USA of who 253 (30%) responded - 38% utilised a pathoanatomical classification system, 32% the McKenzie classification system, 9% the treatment-based classification system, and 7% movement impairment classification.

**Takasaki H, Saiki T, Iwasada Y, McKenzie Therapists Adhere More to Evidence-Based Guidelines and Have a More Biopsychosocial Perspective on the Management of Patients with Low Back Pain than General Physical Therapists in Japan, *Open Journal of Therapy and Rehabilitation, 2:173-181,* 2014**

Survey of 56 Cred MDT therapists and 53 general therapist in Japan. Looking at adherence to LBP guidelines and how biopsychosocial orientated they were. Regression analysis was performed. Cred MDT therapists were more guideline consistent and had a more biopsychosocial orientation than general therapists.

## STUDIES INTO ASSESSMENT, DIAGNOSIS AND PROCEDURES (selected; more on MII website reference list)

**Billis EV, McCarthy CJ, Oldham JA, Subclassification of low back pain: a cross-country comparison. *Eur Spine J, 16:865-879,* 2007**

The McKenzie classification system was found to be by far the most internationally used of back pain classification systems.

**Bybee RF, Mamantov J, Meekins W, Witt J, Byars A, Greenwood M, Comparison of two stretching protocols on lumbar spine extension, *J Back Musculoskeletal Rehab, 21.153-159,* 2008**

101 volunteers without back pain were randomised to one of 3 groups: repeated extension or static extension stretching or a control group. Participants were to perform stretches 8 times a day for 8 weeks. Both stretching groups increased range of movement at 4 and 8 weeks, the repeated more than the static stretch.

**Clare HA, Adams R, Maher CG, Construct validity of lumbar extension measures in McKenzie Derangement syndrome. *Manual Therapy, 12:328-334,* 2007**

50 consecutive patients were classified as derangement (40) or non-derangement (10) and treated with extension procedures; extension range of movement was measured at baseline and at day 5. All patients gained extension but those classified as derangement had significantly more improvement in extension and significantly better globally perceived effect scores. The modified Schober test in standing was the most responsive was to measure extension range of the 4 methods tested.

**Clare HA, Adams R, Maher CG., Reliability of detection of lumbar lateral shift. *J Manipulative Physiol Ther, Oct;26(8):476-80,* 2003**

148 therapists (students, PTs, PTs with McKenzie training) viewed slides from 45 patients to determine presence, direction, and certainty of lateral shift or absence of shift. ICC values represented fair to good reliability for both intra and inter-tester reliability; kappa values were all < 0.4 (fair reliability).

**Donahue MS, Riddle DL, Sullivan MS., Intertester reliability of a modified version of McKenzie's lateral shift assessments obtained on patients with low back pain. *Phys Ther, Jul;76(7):706-16,* 1995**

Determination of a lateral shift by observation was found to be very unreliable. Determination of positive side-gliding test, based on alteration of patient's pain, was found to be of high reliability.

**Downie A, Williams CM, Henschke N, Hancock MJ, Ostelo RW, de Vet HC, Macaskill P, Irwig L, van Tulder MW, Koes BW, Maher CG, Red flags to screen for malignancy and fracture in patients with low back pain: systematic review., *BMJ, 347,* 2012**

**Flavell C, Gordon S, Marshman L, Classification characteristics of a chronic low back pain population using a combined McKenzie and patho-anatomical assessment. *Manual Therapy, 26, 201-207, 2016***

This prospective study attempted to combine MDT assessment and classification with a pathoanatomical based assessment. The prevalence rates for Mckenzie syndromes reported contrasted significantly with previously reported data.

**Fritz JM, Delitto A, Vignovic M, Busse RG, Interrater reliability of judgments of the centralization phenomenon and status change during movement testing in patients with low back pain. *Arch Phys Med Rehabil, Jan;81(1):57-61,* 1999**

40 students and 40 physical therapists reviewed a composite videotape made during assessment of back pain patients and had to make judgements on changes in pain status with movement testing. Intertester reliability was excellent, kappa = 0.79.

**Green AJ, Jackson DA, Klaber Moffett JA, An observational study of physiotherapists use of cognitive-behavioural principles in the management of patients with back pain and neck pain. *Physiotherapy, 94.306-313,* 2008**

This was an observational study of 10 therapists conducted within a trial comparing McKenzie method to a cognitive behavioural approach to assess how much therapists involved patients in the consultation and empowered them to develop self-management strategies; it used a tool specifically developed for the study. Patient involvement and empowerment was low in both approaches, but the cognitive behavioural group scored higher overall in both.

**Greenhalgh S and Selfe J, A Qualitative Investigation of Red Flags for Serious Spinal Pathology., *Physiotherapy, 95:3, Pgs 149-236,* 2009**

**Gutke A, Kjellby-Wendt G, Oberg B., The inter-rater reliability of a standardised classification system for pregnancy-related lumbopelvic pain., *Man Ther, 15.13-18,* 2009**

31 pregnant women were evaluated by 2 therapists using MDT assessment and pelvic pain provocation tests and classified as lumbar, pelvic or mixed in origin. There was 87% agreement, kappa 0.79; at least 23/31 had pelvic girdle or combined pain.

**Henschke N, Maher CG et al, Prevalence of and Screening for Serious Spinal Pathology in Patients Presenting to Primary Care Settings With Acute Low Back Pain, *Arthritis and Rheumatism, Vol. 60, No.10, pp. 3072-3080,* 2009**

**Horton SJ, Franz A, Mechanical Diagnosis and Therapy approach to assessment and treatment of derangement of the sacro-iliac joint. *Manual Therapy, 12:126-132,* 2007**

Description of a case in which lumbar spine pain was ruled out and then direction preference exercises targeting the SIJ abolished a patients 2-year history of buttock and thigh pain.

**Kilby J, Stigant M, Roberts A, The Reliability of Back Pain Assessment by Physiotherapists using a 'McKenzie Algorithm'. *Physiotherapy, 76:9;579-583,* 1989**

Kilby presents a McKenzie algorithm which was found to be intertester reliable, except with regard to identifying the presence of a lateral shift or a kyphotic lumbar spine.

 

**Kilpikoski S, Airaksinen O, Kankaanpaa M, Leminen P, Videman T, Alen M. Interexaminer reliability of low back pain assessment using the McKenzie method. *Spine, Apr 15;27(8):E207-14,* 2001**

39 patients with back pain were assessed by 2 therapists in turn, clinical and classification decisions were compared using Kappa statistics. Agreement was poorer for presence of lateral shift than relevance of shift or lateral component. Agreement on centralisation, directional preference, and mechanical classification was good to excellent.

**Laslett M, Manual correction of an acute lumbar lateral shift: maintenance of correction and rehabilitation: a case report with video. *J Manual Manip Ther, 17:78-85,* 2009**

Case report of a patient with a lateral shift who responds rapidly to manual correction and progresses on to gym based rehabilitation, with an accompanying video.

**Laslett M, McDonald B, Tropp H, Aprill CN, Oberg B, Agreement between diagnosis reached by clinical examination and available reference standards: a prospective study of 216 patients with lumbopelvic pain. *BMC Musculoskeletal Disord, 6:28,* 2005**

In 216 patients with chronic low back pain structural diagnosis, as defined by intra-articular injections or discography was compared to clinical diagnosis: discogenic pain defined as centralisation or directional preference. Discogenic pain was the commonest diagnosis by both radiographer and physiotherapist, followed by illness behaviour and indeterminate. Diagnoses of SIJ or facet joint were rarely made. Agreement between radiographer and clinical examination was weak.

**Laslett M, Williams M, The reliability of selected pain provocation tests for sacroiliac joint pathology, *Spine, 19(11):1243-1249,* 1993**

Five of the seven tests were shown to be reliable, and may be used to detect a sacroiliac cause of low back pain. They were the distraction (or gapping) test, compression test, posterior shear (or thigh thrust) test, left and right pelvic torsion (or Gaenslen's) test.

**Laslett M, Young SB, Aprill CN, McDonald B., Diagnosing painful sacroiliac joints: A validity study of a McKenzie evaluation and sacroiliac provocation tests. *Aust J Physiother, 49(2):89-97,* 2003**

Using initial Mechanical evaluation to exclude mechanical responders and 3 or more positive pain provocation SIJ tests compared to a double intra-articular injection was more accurate in diagnosing SIJ problems (sensitivity 91%, specificity 87%) than SIJ pain provocation tests only (sensitivity 91%, specificity 78%).

**May S, Littlewood C, Bishop A, Reliability of procedures used in the physical examination of non-specific low back pain: a systematic review. *Aust J Physiother, 52(2):91-102,* 2006**

48 studies met the inclusion and exclusion criteria, and were grouped under types as: palpation, symptom response, observation, classification system. Very few physical examination procedures were deemed to be consistently reliable at threshold of reliability coefficient of 0.85. At reliability coefficient 0.70 evidence about pain response to repeated movements changed from contradictory to moderate evidence for high reliability. The McKenzie classification system had contradictory reliability; of 3 high quality studies 2 demonstrated reliability one did not _x0013_ the study demonstrating lack of reliability used inexperienced therapists with limited / no training in MDT.

 

**May S, Rosedale R, A case of a potential manipulation responder whose back pain resolved with flexion exercises. *J Manipulative Physiol Ther, 30:539-542,* 2007**

Case study of a patient who met 4 / 5 of clinical prediction rule criteria for a manipulation responder but who also displayed a directional preference for flexion exercises, and resolved symptoms and functional disability rapidly with self-management exercises. This suggests that clinical prediction rule criteria for manipulation responders and directional preference may not be discrete groups.

**McKenzie RA, Manual Correction of Sciatic Scoliosis, *New Zealand Med J, 484,76:194-199,* 1971**

McKenzie outlines the treatment procedure for manual correction of sciatic scoliosis.

**Petersen T, Olsen S, Laslett M et al., Inter-tester reliability of a new diagnostic classification system for patients with non-specific low back pain. *Aust J Physiother, 50:85-91,* 2004**

Reliability study of their classification system, which borrows many aspects from McKenzie system. Kappa values for mechanical syndromes (derangement, dysfunction, postural syndrome) mostly > 0.60.

**Petersen T, Thorsen H, Manniche C, Ekdahl C, Classification of non-specific low back pain: a review of the literature on classification systems relevant to physiotherapy. *Phys Ther Rev, 4:265-281,* 1998**

A critical appraisal, using a systematic approach, of 8 classification systems for non-specific back pain. Various types of validity are examined, and despite having weaknesses in reliability and content validity, the McKenzie system is rated as one of the most promising.

**Razmjou H, Kramer JF, Yamada R, Intertester reliability of the McKenzie evaluation in assessing patients with mechanical low-back pain. *J Orthop Sports Phys Ther, Jul;30(7):368-383,* 1999**

Two physical therapists, one assessor, one observer, both experienced in McKenzie assessed 45 subjects and were analysed on agreements using Kappa statistics. Agreement on syndromes was good (93%), derangement sub-syndrome classification was excellent (97%), presence of lateral shift was moderate (78%), relevance of lateral shift and lateral component was very good/excellent (98%), deformity in sagittal plane was excellent (100%).

**Werneke MW, Deutscher D, Hart DL, Stratfoed P, Ladin J, Weinberg J, Herbowy S, Resnik L., McKenzie lumbar classifications: inter-rate agreement by physical therapists with different levels of formal McKenzie post-graduate training. *Spine, 39(3):E182-90,* 2014**

47 raters examined 1,662 patients who had completed various levels of courses; A through to D, and paired therapists sequentially examined the same patients in a blinded fashion. Agreement on McKenzie syndrome, lateral shift, reducible versus irreducible derangement, directional preference and centralisation was poor, with all kappa values below 0.44. Sequential course completion did not necessarily improve reliability.

**Young S, Aprill C, Laslett M, Correlation of clinical examination characteristics with three sources of chronic low back pain, *Spine, 3.460-465,* 2003**

In 81 chronic back pain patients 51 had positive response to diagnostic injection into disc, zygapophyseal or sacro-iliac joints. Centralisation, midline pain, and pain on rising from sitting were significantly associated with a positive discogram. Sacro-iliac joint pain was strongly associated with 3 or more positive pain provocation tests, pain

on rising from sitting, unilateral pain and absence of mid-line or lumbar pain. Zygapophyseal pain was associated with absence of pain on rising from sitting.

## ANATOMICAL PHYSIOLOGICAL & PAIN STUDIES (selected; more on MII website reference list)

**Al-Obaidi S, Anthony J, Dean E, Al-Shuwai N., Cardiovascular responses to repetitive McKenzie lumbar spine exercises, *Phys Ther, Sep;81(9):1524-1533,* 2000**

Blood pressure and heart rate goes up in normal individuals when they perform repeated exercises as described by McKenzie.

**Al-Obaidi SM, Asbeutah A, Al-Sayegh N, Dean E., To establish whether McKenzie lumbar flexion and extension mobility exercises performed in lying affect central as well as systemic hemodynamics: a crossover experimental study. *Physiotherapy, 99:3:258-265,* 2013**

In healthy male volunteers repeated flexion and extension movements tend to increase the work of the heart, especially with more repetitions.

**Alexander LA, Hancock E, Agouris I, Smith FW, MacSween A, The response of the nucleus pulposus of the lumbar intervertebral discs to functionally loaded positions. *Spine, 32:1508-1512,* 2007**

First ever study using upright magnetic resonance imaging of effect of functional positions on movement of the nucleus pulposus (NP) in 11 volunteers. In sitting there was significantly less lordosis than prone lying and standing, and significantly more posterior migration of the NP than other positions.

**Astfalck RG, O'Sullivan PB, Straker LM, Smith AJ, Burnett A, Caneiro JP, Dankaerts W, Sitting postures and trunk muscle activity in adolescents with and without nonspecific chronic low back pain. An analysis based on subclassification. *Spine, 35:1387-1395,* 2010**

Cross-sectional comparison of adolescents with and without back pain regarding posture and muscle activity, with no differences identified between groups. However flexion responders sat in more lordosis, and extension responders sat in more kyphosis, but muscle activity displayed no clear cut differences.

**Bakker EW, Verhagen AP, Lucas C, Koning HJ, de Haan RJ, Koes BW., Daily spinal mechanical loading as a risk factor for acute non-specific low back pain: a case-control study using the 24-Hour Schedule. *Eur Spine J., Jan;16(1):107-13,* 2007**

100 cases with acute back pain were compared by a blinded assessor with 100 controls using the 24-Hour Schedule, which quantifies spinal mechanical loading taking into account duration of activity, sagittal movement and loading status. There were no significant differences between cases and controls in predominant work postures. There were significant differences between the groups in hours in flexion and extension, with cases spending significantly more hours in flexion and significantly less likely to be in extended postures.

**Bakker EWP, Verhagen AP, Lucas C, Koning HJCMF, Koes BW, Spinal mechanical load: a predictor of persistent low back pain? A prospective cohort study. *Eur Spine J, 16:933-941,* 2007**

A prospective cohort study of 100 back pain patients who were reviewed at 6 months (N = 88) when 60% reported persistent back pain. Baseline factors were analysed for their association with back pain. Multivariate analysis found smoking and older age (protective) to be associated, while univariate analysis found the 24-hour schedule to be, this is a measure of spine mechanical load.

**Beattie PF, Arnot CF, Donley JW, Noda H, Bailey L, The immediate reduction in low back pain intensity following lumbar joint mobilization and prone press-ups is associated with increased diffusion of water in the L5-S1 intervertebral disc. *JOSPT, 40.256-264,* 2010**

20 patients with back pain who received extension mobilizations and extension in lying were monitored with MRI before and after, and classified as responders if there was a reduction in pain score of 2 or more. Responders demonstrated a mean increase in diffusion coefficient in the middle portion of the disc compared to a mean decrease in the non-responders.

**Beattie PF, Brooks WM, Rothstein JM, Sibbitt WL Jr, Robergs RA, MacLean T, Hart BL., Effect of lordosis on the position of the nucleus pulposus in supine subjects. A study using magnetic resonance imaging (MRI). *Spine, Sep 15;19(18):2096-2102,* 1993**

In vivo some anterior displacement of the nucleus pulposus with extension movements was observed. Degenerated discs appear to behave differently from non-degenerated discs.

**Boissonnault W, Fabio RP., Pain profile of patients with low back pain referred to physical therapy. J Orthop Sports Phys Ther, Oct;24(4):180-91, 1995**

98 patients with chronic back pain surveyed about aggravating and relieving factors etc. Pain was worse in morning and evening, and commonest aggravating factors were sitting, driving, bending, and lifting. Commonest alleviating postures were recumbency, changing positions, and walking. Non-serious night pain was common.

**Dankaerts W, O'Sullivan P, Burnett A, Straker L, Davey P, Gupta R, Discriminating health controls and two clinical subgroups of non-specific chronic low back pain patients using trunk muscle activation and lumbosacral kinematics of postures and movements. *Spine, 34:1610-1618,* 2009**

According to the authors classification system those who get pain relief from spinal extension sit in more flexion and those who get relief from spinal flexion sit with more extension compared with control groups.

**Dankaerts W, O'Sullivan P, Burnett A, Straker L., Differences in sitting postures are associated with nonspecific chronic low back pain disorders when patients are subclassified, *Spine, Mar 15;31(6):698-704,* 2006**

An examination of the sitting posture of back pain patients, analysed as non-specific or according to a novel classification system, and non-back pain controls. There was no difference in sitting posture between controls and un-differentiated back pain patients; however there were significant differences between sub-groups and controls. Flexion pattern patients, with a directional preference for extension, had a more kyphotic sitting pattern than controls; and active extension pattern patients, who had a directional preference for flexion had a more lordotic sitting posture than controls.

**Fazey PJ, Song S, Monsas A et al, An MRI investigation of intervertebral disc deformation in response to torsion. *Clin Biomech, 21;538-542,* 2006**

MRI investigation of 3 asymptomatic women showing that in most instances extension caused anterior deformation of nucleus, flexion posterior deformation, and left rotation deformation to the right.

**Fazey PJ, Takasaki H, Singer KP, Nucleus pulposus deformation in response to lumbar spine lateral flexion: an in vivo MRI investigation. *Eur Spine J, 19(7):1115-20,* 2010**

A novel MRI method derived from pixels and the effect lateral flexion is described; in 95% of healthy subjects the nucleus pulposus was displaced away from the direction of lateral flexion.

**Fennell A.J.; Jones, A.P.; Hukins, D.W.L., Migration of the Nucleus Pulposus Within the Intervertebral Disc During Flexion and Extension of the Spine, *Spine, 21:2753-2757,* 1995**

In vivo flexion tends to cause posterior displacement of the nucleus pulposus and extension anterior displacement using MRI.

**May S, Nanche G, Pingle S, High frequency of McKenzie's postural syndrome in young population of non-care seeking individuals., *J Man Manip Ther, 19:48-54,* 2011**

In a population under 30 years of age 138 were approached to participate in a questionnaire and 100 agreed to participate; of these 66 appeared to have postural syndromes, and they were asked to attend a physical examination, of which 37 consented. Of these 31 met the criteria for postural syndrome, with the syndrome being significantly associated with sustained loading and abolition of pain on posture correction. Symptoms were mostly, but not only, spinal, and mostly, but not only, provoked by sustained sitting.

**Murphy S, Buckle P, Stubbs D, Classroom posture and self-reported back and neck pain in school children., *Applied Ergonomics, 35:113-120,* 2004**

The sitting posture and self-reported pain was measured in 66 school children, mean age 13. Significant associations were found between self-reported spine pain and: lesson length, sustained trunk or neck flexion, and time working at the desk

**Nakashima H, Yukawa Y, Suda K, Yamagata M, Ueta T, Kato F, Abnormal Findings on Magnetic Resonance Images of the Cervical Spines in 1211 Asymptomatic Subjects, *Spine, 40,6,392-398 ,* 2015**

In this asymptomatic population disc bulging was seen frequently, increasing between the ages of 20 and 50. Even those in their 20s had a high proportion of disc bulging. Cord compression increased after the age of 50

**O'Sullivan K, McCarthy R, White A, O'Sullivan L, Dankaerts W., Can we reduce the effort of maintaining a neutral sitting posture? A pilot study. *Manual Therapy, 17:566-571,* 2012**

In 12 symptom-free volunteers maintaining unsupported neutral, lordotic sitting abdominal muscles were activated. Activity only in lumbar multifidus was significantly less when maintaining same position in a forward sloping chair.

**O'Sullivan K, O'Dea P, Dankaerts W, O'Sullivan P, Clifford A, O'Sullivan L, Neutral lumbar spine sitting posture in pain-free subjects. *Man Ther, 15:557-561,* 2010**

The habitual sitting posture of 17 pain-free individuals was significantly more flexed than individuals' subjectively perceived ideal posture, and the tester perceived neutral posture; with no significant difference between the last 2. Two testers could reliably position subjects in the tester perceived neutral posture (ICC = 0.91).

**O'Sullivan P, Dankaerts W, Burnett A et al, Evaluation of the flexion relaxation phenomenon of the trunk muscles in sitting. *Spine, 31;2009-2016,* 2006**

In 24 healthy volunteers neutral lordotic sitting posture facilitated multifidus and internal oblique muscles, whereas slumped sitting caused a significant decrease in

 

their activity. Activity of erector spinae varied during slumped sitting in some it increased and in some it decreased.

**Powers CM, Beneck GJ, Kulig K, Landel RF, Fredericson M, Effects of a single session of posterior-to-anterior spinal mobilization and press-up exercise on pain response and lumbar spine extension in people with non-specific low back pain. *Phys Ther, 88:485-493,* 2008**

Comparison of the effects, on short-term pain scores on extension in standing and extension range as measured by MRI, in 30 patients with back pain randomised to a single session of spinal mobilisation or extension in lying. There were significant improvements in both pain and range in both groups, but no significant differences between the groups.

**Pynt J, Higgs J, Mackey M, Seeking the optimal posture of the seated lumbar spine. *Physio Theory & Pract, 17;5-21,* 2000**

A review of the literature on the optimal sitting posture for spinal health, based mostly on cadaveric studies, but some clinical studies. They conclude that the arguments in favour of a kyphotic sitting position are not substantiated by research; and that a lordotic position, interspersed with regular movement, is the optimal sitting posture and assists in preventing back pain.

**Scannell JP and McGill SM, Disc Prolapse: Evidence of Reversal with Repeated Extension. *Spine, Volume 14, Number 4, pp. 344-350,* 2009**

Porcine cadaver study of cervical spine - loading in flexion produced nucleus prolapse in 11 of the 18 specimens. In 5 of the 11 the prolapse was reduced with repeated loading into extension.

**Schnebel BE, Simmons JW, Chowning J, Davidson R., A digitizing technique for the study of movement of intradiscal dye in response to flexion and extension of the lumbar spine., *Spine, Mar;13(3):309-12,* 1987**

Nuclear material in normal discs moves anteriorly with extension and posteriorly with flexion, however movements in degenerated discs were less predictable.

**Takasaki H, Comparable effect of simulated side bending and side gliding positions on the direction and magnitude of lumbar disc hydration shift: in vivo MRI mechanistic study, *J Man Manip Ther, 32:2:101-108,* 2015**

The study compared the effect of side gliding to side bending in the lumbar spine on disc hydration. Side gliding produced comparable effects to side bending on lumbar disc hydration

**Takasaki H, May S, Fazey PJ, Hall T., Nucleus pulposus deformation following application of mechanical diagnosis and therapy: a single case report with magnetic resonance imaging. *J Man Manip Ther, 18:153-158,* 2010**

Case study in which symptom resolution coincided with change in MRI findings from baseline to one month with use of MDT therapy.

**Womersley L, May S., Sitting posture of subjects with postural backache. *J Manipulative Physiol Ther, Mar-Apr;29(3):213-8,* 2006**

Nine students were classified as postural backache (history of mild backache but no functional disability) and 9 as control (no history of backache). Postural activity was recorded over 3 days and relaxed sustained sitting posture observed with computerised video analysis. The postural backache group had significantly longer periods of uninterrupted sitting and sat with greater flexion when relaxed.

 

## DISCUSSION ARTICLES (selected; more on MII website reference list)

**McKenzie RA, A perspective on Manipulative Therapy, *Physiotherapy, 75:8. pp 440-444,* 1988**

McKenzie presents a review of spinal manipulative therapy and suggests that therapist generated forces should only be indicated when patient generated forces have been exhausted.

**Rosedale R, Hoyt K, Clare H, Schenk R, Letter to the Editor: On "Treatment-Based Classification System for Low Back Pain: Revision and Update." Alrwaily M, Timko M, Schneider M, et al. Phys Ther. 2016;96:1057–1066., *Physical Therapy, 96, 10, 1669-1670,* 2016**

This letter to the Editor questions some of the statements made in the TBC update article by Alrwaily regarding the extensiveness of the evidence supporting MDT and TBC and also regarding the evidence demonstrating the effect of MDT on psychosocial variables.

**Rosedale R, Lynch G, Clare H, Letter to the Editor; Regarding 'Classification characteristics of a chronic low back pain population using a combined McKenzie and patho-anatomical assessment' authored by Flavell C et al., Manual Therapy 26 (2016), 201-207. *Musculoskeletal Science and Practice. 27:e5-e6.* 2017**

This letter is in response to an article that combines MDT and pathoanatomy. It discusses the value of such a combination of diagnostic approaches and questions some of the prevalence data presented.

**Rosedale R, Supp G, Hoyt K, Lynch G, Clare H, Letter to the Editor-in-Chief; Regarding the complexity of Low Back Pain. *J Orthop Sports Phys Ther. 47(2), 126-129,* 2017**

This letter is in response to an article that discusses some of the current issues with low back pain diagnoses and management. The letter clarifies the meaning of the Derangement classification as a non-pathoanatomic diagnosis and puts forward the case for MDT being a biopsychosocial approach.

**Sagi G, Process to clinically identify a directional preference in patients suffering from spinal mechanical pain with the McKenzie method. *Kines Rev, 99.17-23,* 2010**

Summary of how therapists can find clues for directional preference in the history and confirm these on physical examination (in French).

**Supp G, Rosedale R, Werneke M. Letter to the Editor; Unjustified extrapolation. *Scand J Pain. 16;189-190* July 2017**

This letter was in response to an article by Rabey et al. and discusses the use of MDT repeated movement testing vs. 'data driven' repeated movement testing. It also questions the unjustified extrapolation of the study results in regards to comprehensiveness of MDT as a biopsychosocial system.

**Watson G, Neuromusculoskeletal physiotherapy: Encouraging self-management. *Physiotherapy, 82:6;352-357,* 1996**

Watson urges that physiotherapists should promote a therapeutic alliance with patients to encourage self-management, an approach that is efficient, increases patient compliance, and helps prevent recurrences.

 

# THE MCKENZIE INSTITUTE INTERNATIONAL
# COURSE EVALUATION FORM

**Course:** **A** B C D E **Location:** **Date:**

**Instructor:** _____ **Co Instructor**_____

Please circle the numbers that most accurately reflects your opinion

**5 = Strongly Agree** **4 = Agree** **3 = Neutral** **2 = Disagree** **1 = Strongly Disagree**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | Course Material was useful | 5 | 4 | 3 | 2 | 1 | N/A |
| 2. | Patient Treatment Sessions were useful | 5 | 4 | 3 | 2 | 1 | N/A |
| 3. | Problem Solving Sessions were useful | 5 | 4 | 3 | 2 | 1 | N/A |
| 4. | Practical Sessions were useful | 5 | 4 | 3 | 2 | 1 | N/A |
| 5. | Were the course Aims and Objectives achieved? | 5 | 4 | 3 | 2 | 1 | |

Comment .....

6. Was there a sufficient balance between theory, problem solving activities, and practical sessions:

5 4 3 2 1

Comment .....

7. Was the course material presented in a way to assist you to be a better clinician?

5 4 3 2 1

Comment .....

8. Did the Instructor present the course content in a clear and precise manner?

5 4 3 2 1

Comment .....

9. Did the Instructor/s create a comfortable learning environment where you were able to ask questions and participate in discussion?

5 4 3 2 1

Comment .....

10. Please list the two most important matters regarding the course that assisted you to learn:

.....

11. Please list the two factors that could be improved to assist with your learning:

.....

*Please use back of sheet for comments if required.*
***We appreciate you completing this evaluation form***