9

Overview of the McKenzie method

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CHAPTER CONTENTS

Clinicians using manual means to manage musculoskeletal conditions face the stark realization that many of our diagnostic and therapeutic methods are not supported by significant external evidence. Much of what is used in the field is an extension of one's clinical training, where the methods of one's mentors become the basis for ongoing practice. This is likely expanded by personal experience and collegial interaction. These manners of knowledge derivation are *integration* processes. Such processes require the parallel track of *synthesis* processes – systematic collection of data through clinical science and outcomes research (controlled clinical trials, systematic reviews, etc.). Indeed, the combination of both types of processes in the approach to clinical practice – termed syntegration – has been described as a more complete knowledge-based approach to patient care than either one alone (Errico 2005).

Although there are no shortage of manual practice approaches based on integration processes (such as mentoring and personal experience), there are few methods that are supported by data from synthesis processes. One notable exception is mechanical diagnosis and therapy of the spine, also known as the McKenzie method (1981). The McKenzie approach allows the clinician the rare opportunity to take methods supported by reasonable published data and integrate them with clinical experience, to improve patient care.

The McKenzie method is often incorrectly equated with spinal extension exercises alone. While these and other exercises are important components of the technique, McKenzie is more correctly understood as a system of diagnosis and treatment based upon predictable responses to mechanical examination. The diagnostic element of McKenzie is often overlooked by those who are not very familiar with the system.

Perhaps the most defining element of the McKenzie diagnostic approach is the central role it gives to patient response. As a patient is put through a series of positions and repetitive movements, reactions are assessed. Does the range of motion increase or decrease? Does pain

intensity rise or fall? Does the location of the pain change? These findings are considered more important than any palpatory assessment. Actually, in many cases, a successful McKenzie examination can be performed without the provider ever touching the patient.

At first this approach may seem incongruous to the manual practitioner; and, indeed, those manual providers who would say, 'Palpation is all' may never reconcile with those McKenzie practitioners who would say 'Palpation is anathema'. However, clinicians who are comfortable navigating the vast waters between these extreme positions can find a blend of approaches that works best for the particular patient's benefit.

This chapter will provide an overview of the McKenzie method. It is aimed at introducing clinicians unfamiliar with this system to the principles and approaches used therein. After reading this chapter, providers should be able to incorporate elements of mechanical diagnosis and therapy into their clinical approach. For further education, the reader is directed to McKenzie's texts and to the McKenzie Institute (www.mckenziemdt.org).

Examination

The heart of the McKenzie assessment procedure is the mechanical examination (McKenzie 1981, Taylor 1996). While the full assessment also includes patient history and postural analysis, this chapter will focus exclusively on the mechanical examination. Furthermore, the lumbar spine will be used as the illustrative example in text and illustrations. Although McKenzie has applied his methods to the cervical spine and extremities, the vast majority of published work on the McKenzie methods relates to the lumbar spine.

The mechanical examination is an assessment of the patient's response to end-range loading (the application of forces). The load can be applied singularly and sustained, or repetitively. This method is different from many other forms of musculoskeletal examination because it is patient-driven. That is, the patient performs much of the examination (via active range of motion) and the patient's responses to the examination maneuvers are considered more important than what the provider may sense via palpation. During the course of the examination, the patient learns which positions and movements are beneficial, and which are harmful; thus the entire process interweaves patient education and active care. McKenzie advocates making the patient as independent as possible – to minimize the chances of becoming reliant on the provider – and this process begins during the examination.

The process of the mechanical examination is outlined in Table 9.1 and Figures 9.1–9.13. At first the patient is instructed to assume a series of static sustained postures at end-range. The significance of the patient's response to these positions will be discussed below; however, at this point it is noteworthy to consider that each position attempts to elicit a change in patient symptomatology by varying the spinal configuration through a range of flexion to extension. This includes sitting slouched (Fig. 9.1), sitting erect (Fig. 9.2), standing slouched (Fig. 9.3) and standing erect (Fig. 9.4). Note that the slouched positions put the lumbar spine in a position of relative

Table 9.1 The mechanical examination

Static (sustained posture at end-range)
Sitting slouched, sitting erect
Standing slouched, standing erect
Lying prone in extension, lying supine in flexion
Dynamic (repetitive end-range movements)
Active
Flexion standing, extension standing
Flexion supine (knee to chest); extension prone (prone press-up)
Side-gliding, right or left, standing or prone
Passive
Mobilization (grades 3–4) in flexion, extension, right or left rotation

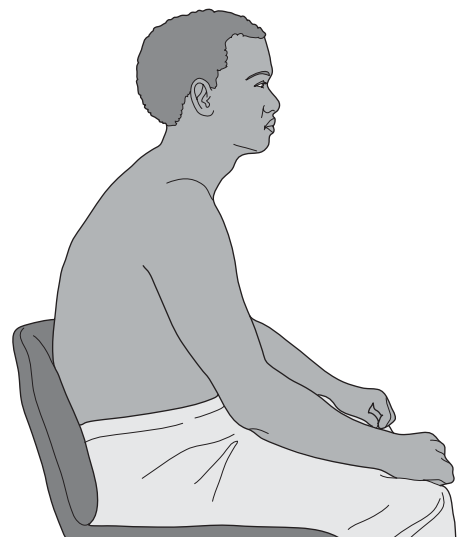


Figure 9.1 Sitting slouching.

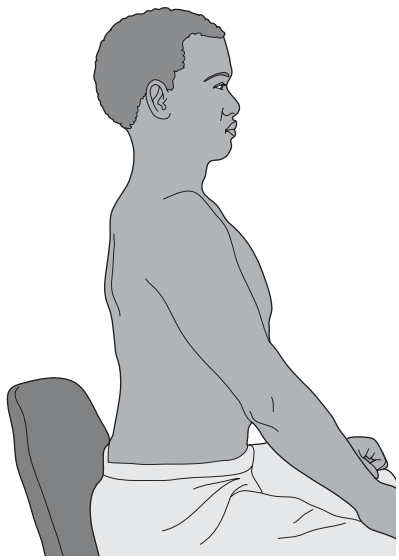


Figure 9.2 Sitting erect.

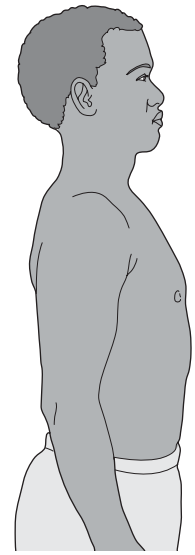


Figure 9.4 Standing erect.

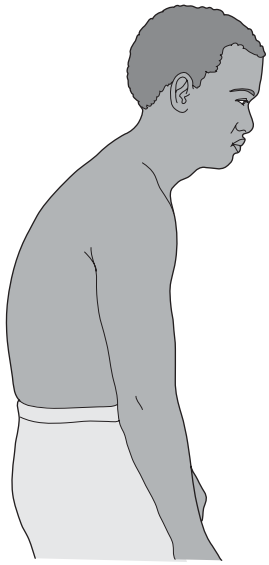


Figure 9.3 Standing slouched.

flexion, while the erect postures introduce relative extension to the spine. Next the patient will lie supine and then prone, so introducing relative flexion and extension, respectively. To increase the amount of flexion the patient may bring the knees to the chest (Fig. 9.6); to increase extension the patient may lie propped up on the forearms (Fig. 9.5). If a patient response is demonstrated at any point during the examination it is not necessary to further increase the given amount of flexion or extension. For instance, if symptoms change during supine lying, knees to chest would not be added.

The dynamic portion of the examination is the assessment of the effects of repetitive end-range movements. This includes both active and passive motions. The active movements are standing flexion (Fig. 9.7), standing extension (Fig. 9.8), supine flexion (knees to chest) and prone extension (prone press-ups). The patient is instructed to perform each of these movements up to ten times in sequence, with the response assessed after each series of repetitions.

Note that up to this point, the entire mechanical examination can be performed without touching the patient, or with only minimal contact to guide the patient through the positions and movements. If the appropriate patient response has occurred (as explained below), the examination is complete. However, if a patient does not exhibit the desired clinical change, further assessment is needed, and the examiner moves on to passive dynamic movements, which are essentially grade 3–4 mobilizations. These are performed supine in flexion (Fig. 9.10), prone in extension (Fig. 9.11), and side-lying in rotation to the right and left (Fig. 9.13).

One variable not discussed previously is side-gliding (Fig. 9.9), or horizontal (x-axis) trunk translation. In the McKenzie system, a patient who initially presents with an antalgic list is also assessed for the response to side-gliding, both standing and prone, active and passive (Fig. 9.12). This assessment is typically reserved only for those patients with an initial list, with the transition movement performed in the direction that would neutralize the list.

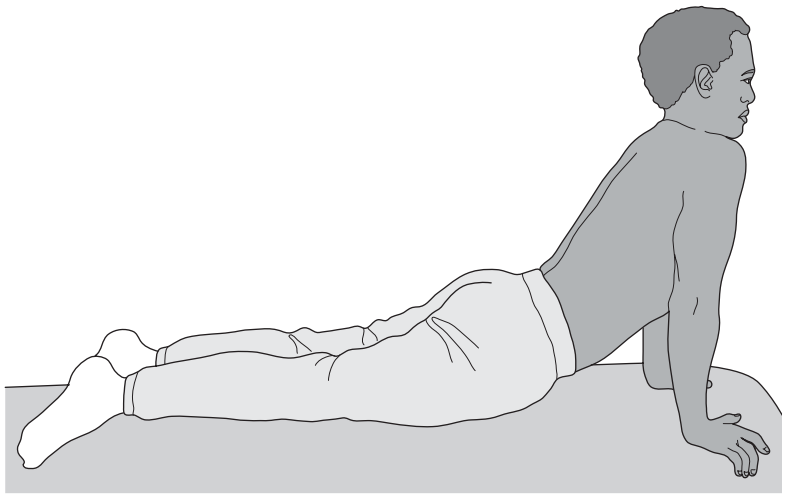


Figure 9.5 Lying prone in extension (press-ups).

Examination findings

While proceeding through the above mechanical examination, the clinician assesses the patient's response in terms of two main variables: range of motion and pain. First, has the range of motion in any given direction increased, decreased or remained stable? In this context an improvement in antalgia is considered an increase in range of motion, such that the patient with an initial left list (shoulders left relative to the pelvis) who stands straighter after a maneuver is said to have gained right lateral flexion. On the other hand, a patient who initially could flex the trunk forward 45° and after several repetitions of flexion can subsequently only flex 25° clearly has a decrease in range of motion. As might be expected, an increase in range of motion that was initially restricted is considered a desirable finding; a decrease in range undesirable.

Next, has the patient's pain complaint changed? Pain is monitored in terms of intensity and location. The intensity of pain, simply, can increase, decrease or remain unchanged.

The location or distribution of pain may change independent of pain intensity. Thus, the pain may spread away from the lumbar region into the buttock, thigh and leg, becoming more distal in its distribution. Alternately, lower extremity pain may decrease or disappear, leaving a smaller distribution of lumbar pain only. The former example, where pain moves distally, is called peripheralization; the latter, where pain shrinks to a

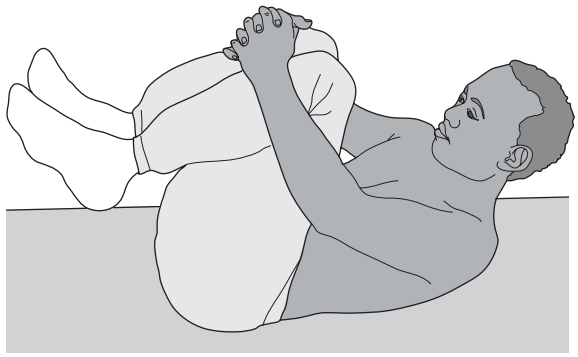


Figure 9.6 Lying supine in flexion (knees to chest).

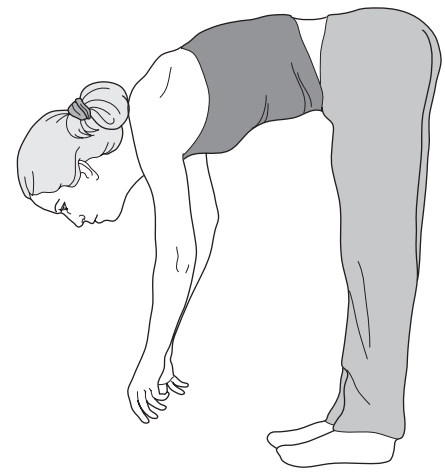


Figure 9.7 Standing in flexion.

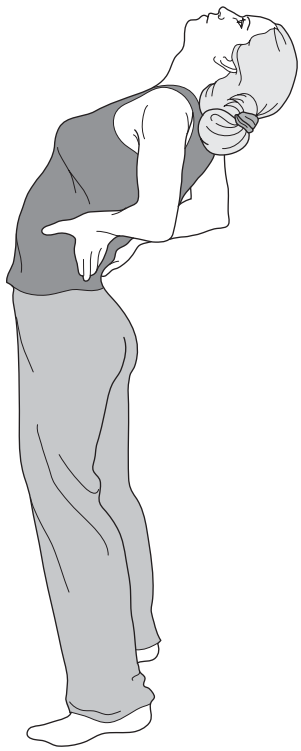


Figure 9.8 Standing in extension.

Figure 9.10 Supine flexion.

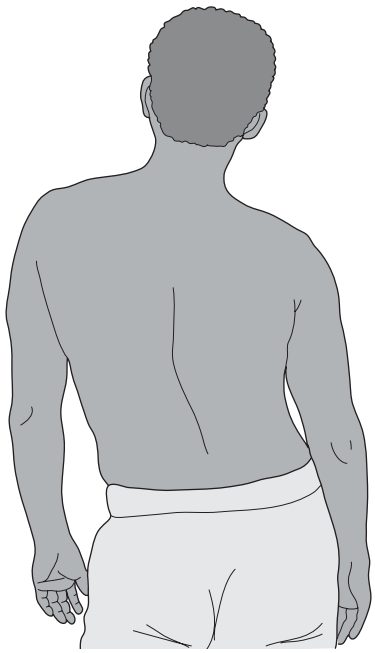


Figure 9.9 Side-gliding.

more proximal location, is called centralization (Fig. 9.14). These terms are of great importance in the McKenzie system and will be discussed in more detail.

Since McKenzie's original description, other authors have applied somewhat varied definitions to centralization, with the key concept remaining the abolition of distal pain in response to positions or repeated movements (Aina et al 2004). Some studies have defined centralization as occurring as long as distal pain is eliminated during the course of treatment over days or weeks; whereas others require distal symptoms to be abolished during the examination. There has been some disagreement as to whether the distal pain must be abolished entirely, or simply decreased. Apart from pain, reduction of distal paresthesia has also been called centralization. These prior differences notwithstanding, it is important to clarify the following defining points. After the patient has assumed a particular position or performed a given repeated movement, centralization is said to have occurred in the following circumstances:

- The most distal symptoms (pain or paresthesia) are eliminated or substantially decreased.
- If the patient presents with local low back pain only, that pain is eliminated.
- The change in distal pain is the defining element, and is often independent of proximal pain. That is, if a patient with low back pain and leg pain

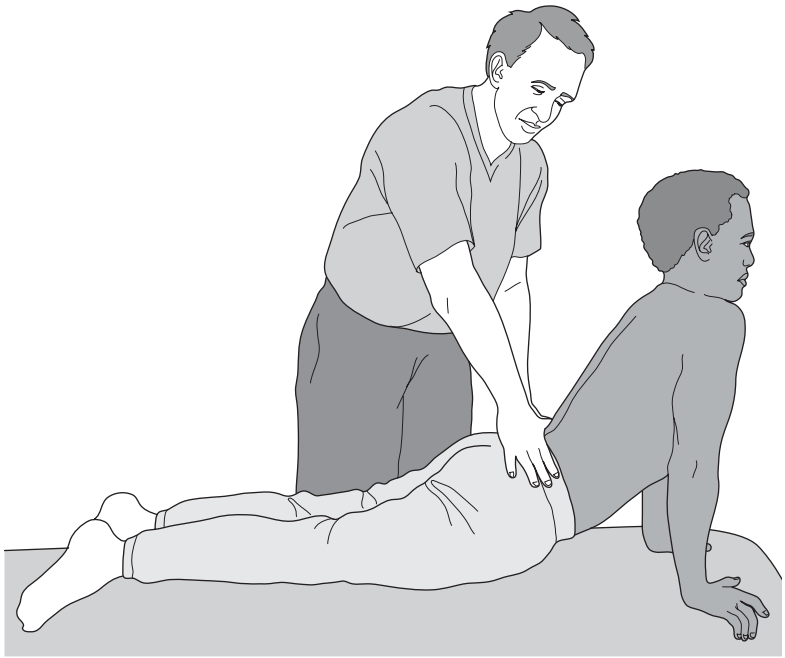


Figure 9.11 Prone extension.

experiences relief of leg pain yet an increase of low back pain, that patient is still said to have centralized. The converse of this is also true: the patient with relief of low back pain and an increase in leg pain has peripheralized.

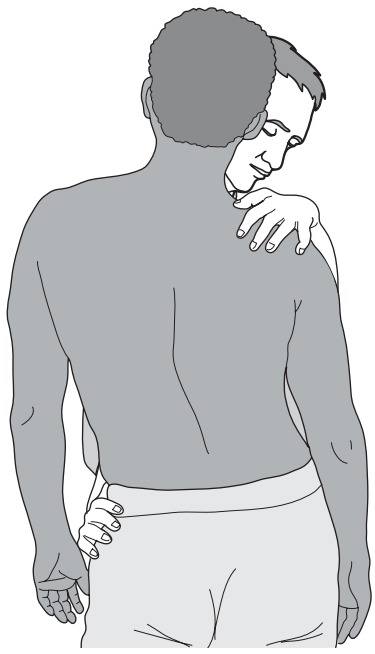


Figure 9.12 Side-gliding, with overpressure.

- The reduction in symptoms is of some duration – seconds to minutes, perhaps hours in excellent responders. There must be some plasticity to the change. (This also applies to peripheralization. In contrast, say, to the palpation of a latent myofascial trigger point, which may cause distal pain while pressure is applied, but results in elimination of distal pain essentially instantly when pressure is removed. If a patient has peripheralized, the distal pain will linger for some time after the posture or repeated movements have ceased.)

As will be seen, achieving centralization is considered advantageous to the patient, and achieving peripheralization is considered disadvantageous (Donelson et al 1991). For this reason, if centralization begins to occur during the course of a particular movement examination, that movement is continued. If peripheralization begins to occur, that movement is ceased. As an example, consider a patient with low back pain radiating to the right buttock. If after four repetitions of standing extension the buttock pain has resolved and the back pain has decreased, additional repetitions of extension would be continued to see if the back pain would decrease further. However, if the back and buttock pain remained, and pain began to be felt in the posterior thigh also, extension would be halted and the examination would continue through the other motions.

Figure 9.13 Supine rotation.

The syndromes

McKenzie has classified mechanical low back pain into three syndromes: postural, dysfunction, and derangement. Each syndrome is defined by a theoretical model of the underlying pathology, plus patient history, postural assessment and mechanical examination findings (Table 9.2). The validity of the theoretical models remains largely undemonstrated, but as McKenzie has stated, the observed clinical phenomena in response to mechanical assessment are important, regardless of the proposed mechanisms, for these phenomena provide guidance for conservative management that has been shown to improve clinical outcome. In order to achieve that outcome, the McKenzie approach outlines treatment implications or strategies for each syndrome. These include strategies for educating patients on proper posture/ergonomics, patient self-care exercises, and manual therapy.

Postural syndrome

The postural syndrome includes patients who are experiencing pain simply due to poor posture. The presumed pathology here is that there is no pathology: this is normal tissue being brought to pain by prolonged loading for which it is not suited. Consider an index finger supporting a load while in a position of flexion. Normal joints, ligaments, capsules and muscles are able to resist this load without discomfort. Now consider that same load being applied with the finger in a position of hyperextension. That same

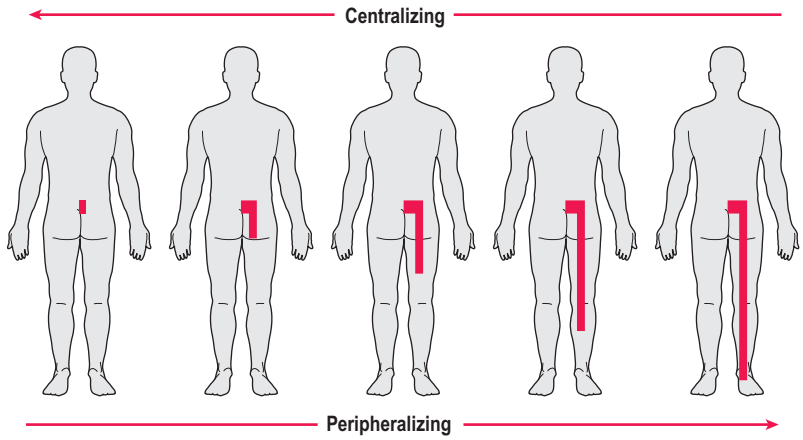


Figure 9.14 Diagrammatic representation of centralization and peripheralization. Moving from left to right depicts peripheralization; from right to left centralization.

Table 9.2 A brief summary of the McKenzie syndromes

Syndrome	Mechanical examination findings	Pathology model	Treatment strategies
Postural	AROM is full and pain-free Repetitive motions are pain-free Sustained posture at normal end-range causes pain	Normal tissue being strained by prolonged inappropriate posture	Avoid painful positions; maintain correct posture
Dysfunction	AROM is restricted in one or more directions with local pain at end-range Repetitive motions are painful at end-range, but may increase range of motion	Chronic soft tissue contracture or fibrosis (facet capsular fibrosis, nerve root adhesions)	Repetitive motions that increase pain are indicated to break adhesions and increase elasticity This applies to: • patient exercises • patient posture/ergonomics • manual treatment
Derangement	AROM is restricted in one or more directions; painful at end-range Repetitive motion reveals centralization (± peripheralization)	Discogenic pain with competent annulus (contained annular tear, internal disc disruption, or herniated disc)	Motions that centralize are indicated Motions that peripheralize are contraindicated This applies to: • patient exercises • patient posture/ergonomics • manual treatment
	AROM is restricted in one or more directions; painful at end-range Repetitive motion reveals peripheralization only (*no* centralization)	Discogenic pain with incompetent annulus (non-contained annular tear, internal disc disruption, or herniated disc)	Avoid peripheralization Often poor prognosis; often poor response to conservative treatment

AROM: active range of motion.

normal anatomy will now be subjected to loading that is biomechanically disadvantageous, and discomfort will result.

During examination, postural syndrome patients will have full range of motion. Repetitive end-range motions do not typically bring on or worsen their pain. This pain is intermittent and only initiated by prolonged (inappropriate) postural overload; thus the patient may be asymptomatic during the examination. The examination procedure likely to be positive is the sustained static posture. Some patients may experience the onset of pain when in a given position for under a minute, while others may take several minutes or more. The practicality of such a prolonged examination varies from one clinical setting to another; however, history findings will guide the examiner to the most likely culpable postures. For instance, the young computer programmer who experiences low back pain after working for many hours will most likely be found to be positive in prolonged seated flexion, rather than prone extension.

Treatment implications for the postural syndrome patient are straightforward – instruct the patient to avoid the problematic posture that is causing pain. Here, it is argued that this advice is the most important intervention and perhaps the only intervention a patient really needs. Giving the patient appropriate education on body mechanics and exercise aimed at strengthening supporting muscles empowers the individual to care for himself.

If the patient truly has full and painless range of motion, it is argued that manual treatment aimed at joints and or myofascial structures is unnecessary and may inappropriately contribute to patient dependence on the provider. To be sure, the patient without any articular or myofascial restriction may be very rare in given clinical populations. Nevertheless, if such a patient is encountered, it is likely that appropriate education and activation will be of greatest value.

Dysfunction syndrome

The dysfunction syndrome patient is characterized by chronic soft-tissue contracture or fibrosis. This may be facet joint capsular fibrosis, nerve root adhesions and the like. Such situation may arise in response to a major trauma or to cumulative microtrauma.

Upon examination these patients will demonstrate a restriction in range of motion in one or more directions. Pain will be elicited at the inappropriately premature end-range. However, this pain will diminish essentially instantly when the patient returns to neutral. During the course of a repetitive motion examination there may be a gradual increase in the restricted range of motion, as the shortened soft tissue is repeatedly brought to tension. This can be thought of as the spinal analog to the clinical presentation of chronic hamstring tightness. An initial simple stretch of hip flexion is painful. Removing the stretch relieves the pain. Repeating the stretch is painful, yet again; however, doing so may start to increase the hip flexion range of motion.

In contrast to the postural syndrome, the therapeutic approach to the dysfunction syndrome patient is to strive for repeated motions that *increase* pain. It is postulated that these motions are required in order to break inappropriate adhesions and increase overall elasticity. These motions are indicated for patient home exercise as well as clinician manual therapy.

One point of clarification is that McKenzie stresses patient self-reliance as the primary goal of treatment. Thus, it would be preferred to have the patient perform the exercises alone if he can achieve the proper response. If the patient is unable to reach any lasting decrease in pain and increase in range of motion by exercise alone, only then would the clinician add manual therapeutic means (in accordance with pain reproduction). Furthermore, the clinician would keep these interventions to a minimum, with the intention of simply assisting the patient to become independent as quickly as possible.

Most contemporaries in spine care would certainly agree on the importance of patient independence and active care; however, the suggestion that *any* amount of passive care leads to patient dependence on the provider has not been demonstrated. Thus the McKenzie stipulation that *all* passive care be omitted in patients who demonstrate success with self-care can be viewed as a guiding suggestion, rather than an admonition. Consequently, the clinician can find rich opportunity to blend manual therapies with repeated motion exercises that both attempt to stretch inappropriately shortened tissue, and educate the patient on the importance of self-sufficiency in the process.

Derangement syndrome

The portion of the McKenzie methods supported by the most significant evidence is its approach to the derangement syndrome patient. In short, derangement refers to lumbar intervertebral disc pathology. McKenzie originally described seven subcategories of derangement. However, in the 2003 revision of his text (McKenzie & May 2003) these have been collapsed into three subcategories. For the purposes of this chapter we will consider derangement to be divided into two subcategories only, corresponding with the relevant supporting evidence.

Lumbar intervertebral disc pathology includes both pathoanatomy (morphometric changes) and pathophysiology (changes in function, namely nociception). The pathoanatomy includes a wide spectrum of structural changes visible on advanced imaging: internal disc disruption, disc bulges and focal herniated discs, with or without nerve root compromise. In each of these cases, a distinction can be made between situations in which the outer annulus is fully intact, and those in which it is breached in one or multiple places. The former is called 'contained' pathology, where the outer annulus contains any distortion present; the latter is 'non-contained' pathology, where the hydrostatic mechanism of the disc is compromised (Fardon & Milette 2001).

As has been shown numerous times, the mere presence of disc pathology as seen on imaging does not correlate with symptoms (Boden et al 1990, Boos et al 1995). However, a very interesting relationship has been shown to exist regarding symptomatic – i.e. painful – lumbar discs. It has been demonstrated that low back pain patients who exhibit centralization upon McKenzie examination are very likely to display a painful lumbar disc(s) with contained pathology as evidenced by provocative discography (Donelson et al 1997, Laslett et al 2005). Conversely, those patients who exhibit peripheralization without centralization are very likely to display a painful lumbar disc(s) with noncontained pathology as evidenced by provocative discography. In other words, the presence of centralization and/or peripheralization upon mechanical examination is highly correlated

with painful lumbar discs upon discography. Moreover, patients who centralize (whether or not they peripheralize also) are likely to demonstrate contained pathology, whereas those who peripheralize only (and do not centralize) are likely to demonstrate noncontained pathology.

During mechanical examination, derangement syndrome patients will display restriction in active range of motion in one or more directions. Pain will be produced at the premature end-range and perhaps during the range of motion prior to that point (this is in contrast to the pain of the dysfunction syndrome, which is only elicited at the restricted end-range). Repetitive motion examination will reveal centralization and/or peripheralization. When centralization occurs, it is typically in response to one given direction of motion only; the opposing direction very commonly, but not always, will cause peripheralization. The motion that results in centralization is called that patient's *directional preference*. In the lumbar spine, extension has been shown to be the most common directional preference (Donelson et al 1991).

A number of studies have examined the frequency with which centralization occurs in patient populations. In one retrospective study it was seen that 76 of 87 patients (87%) experienced centralization of symptoms in response to repeated end-range movements in a single direction (Donelson et al 1990). In each case, movement in the opposite direction always exacerbated distal symptoms.

A prospective study examining only sagittal motions in 145 patients with low back pain, with or without lower extremity pain, demonstrated a frequency of 47% (Donelson et al 1991). In a prospective descriptive analysis of the centralization phenomenon in 289 patients with low back pain or neck pain, with or without extremity symptoms, 30.8% of subjects were classified as centralizers, 23.2% as non-centralizers, and 46% as partial reduction (Werneke et al 1999).

Good reliability (kappa = 0.823. percentage agreement of 89.7%) has been shown among 40 physical therapists in deciding whether centralization, peripheralization, or neither had occurred (Fritz et al 2000).

Another study also demonstrated good reliability between two physical therapists for classifying patients into McKenzie syndromes (kappa = 0.70, percentage agreement of 93%) (Razmjou et al 2000). In this work, when centralization or peripheralization occurred, the reliability increased to excellent (kappa = 0.96, percentage agreement of 97%).

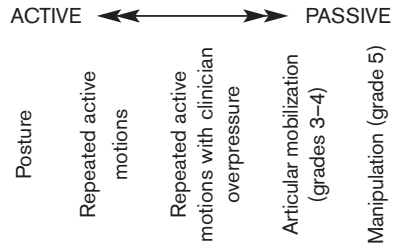
Other work has shown that patients who centralize achieve superior clinical outcomes compared with those who do not. Long (1995) investigated 223 subjects with chronic low back pain with or without lower extremity pain and found that the centralizer

Box 9.1 General note on manual therapy

The McKenzie method emphasizes the primary importance of patient education and self-care. The technique includes a focused role for manual therapy in the context of achieving desired mechanical outcomes.

As has been described in the text, centralization of symptoms and/or increase in restricted range of motion are advantageous for a patient. The goal of the McKenzie approach is to identify positions/movements that produce the advantageous results (diagnosis), and then apply these positions/movements to reach positive outcome (treatment). Manual therapy is included in both diagnosis and treatment. However, in each case it is employed only as a second tier option for situations where active methods did not achieve the desired result.

In the McKenzie system the mechanical methods can be thought of as existing on a continuum from active to passive means as shown below.



The guiding principle is to utilize active methods first, moving sequentially further to the right on the spectrum only when the preceding method has failed. In some patients, successful diagnosis and outcome can be obtained with active methods from the start. Other cases will initially require the use of mobilization or manipulation in order to achieve centralization and/or increased range of motion. Yet during the course of care the intent is to use less of the passive and more of the active methods as quickly as possible, while still maintaining positive outcome.

The manual therapies described within the McKenzie method are joint mobilization and manipulation, with the latter considered more aggressive than the former. However, the eclectic clinician may blend other forms of soft-tissue therapies into this approach. Since the principles of centralization and peripheralization in particular are supported by significant evidence, for those patients who demonstrate either, it would behoove the clinician to strive for centralization and avoid peripheralization during the application of any myofascial release technique.

group had a significantly greater decrease in maximum pain intensity scores on the NRS-101 Pain Scale and a significantly higher return-to-work status. Improved return-to-work rates were also seen among centralizers in a study of 126 consecutive low back pain patients, with or without leg pain (Karas et al 1997). The centralizers among 289 patients with low back or neck pain experienced a greater reduction in pain intensity on an 11-point pain scale, and increase in function as measured by the Oswestry Questionnaire or Neck Disability Index (Werneke et al 1999).

For those patients who can be made to centralize, treatment is always aimed at achieving centralization and avoiding peripheralization. Thus, exercises, ergonomics and manual therapies are employed following the patient's directional preference. For instance, a patient who centralized upon repeated extension will be given extension exercise, advised to maintain lordotic postures, and receive manual treatment favoring extension. As in the dysfunction syndrome, the McKenzie approach advocates refraining from passive treatment in cases where patients can achieve positive changes – in this instance centralization – by performing active exercises (Box 9.1).

Those patients who peripheralize only, and do not centralize upon any movement, present the clinician with a more challenging situation. In the absence of a clear directional preference, there is not one particular motion for which to strive. Avoiding peripheralization does remain a guiding principle for exercise, body mechanics and in-office care; however, this alone is not as valuable as having a particular direction/posture that results in positive change. In fact, it has been shown that these patients often have a poor response to conservative treatment, and may be more likely to require surgical intervention (Donelson et al 1997).

In summary, remembering the following key points may be particularly helpful to the clinician. Centralization occurs with a frequency of 30.8% to 87%, and good to excellent inter-examiner reliability regarding assessment of centralization has been demonstrated.

A single preferred direction of motion typically results in centralization. When present, centralization and/or peripheralization indicate painful intervertebral disc pathology.

Pain that centralizes probably arises from a disc with a competent annulus; pain that peripheralizes but does not centralize probably arises from a disc with an incompetent annulus. For patients with intervertebral disc pathology, those whose symptoms can be made to centralize have a better prognosis for response to conservative care than those whose symptoms cannot.

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