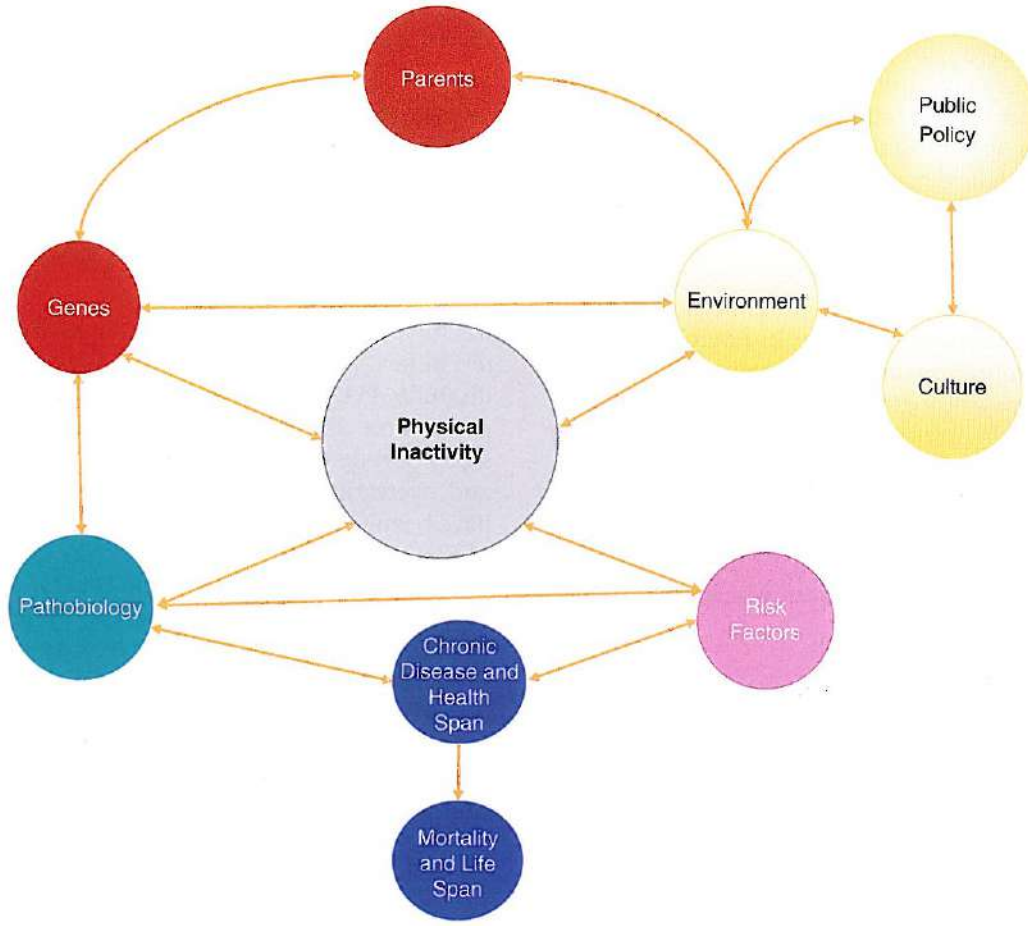


Figure 1.1 The influence of physical inactivity. Adapted from Booth FW, Roberts CK, Thyfault JP, Ruegsegger GN, Toedebusch RG. Role of inactivity in chronic diseases: evolutionary insight and pathophysiological mechanisms. *Physiol Rev.* 2017;97(4):1351-1402.

Assessing the amount of **moderate** PA per week could quickly become a standard of care in clinical practice by asking two simple questions[26]:

1. "On average, how many days per week do you engage in moderate or greater intensity PA (like a brisk walk)?"
2. "On average, how many minutes do you engage in this PA in those days?"

To achieve the minimal WHO recommendations for cardiorespiratory endurance exercise, the product of the two responses should be ≥150 minutes per week (≥75 minutes per week for **vigorous** PA only).[27] If the patient does not meet these recommendations, he/she should be advised to engage adequately in PA according to his/her capability. Specific recommendations according to types of chronic disease have been published by Pedersen and Saltin.[28]

How Did We Get Here? LBP is ubiquitous; symptoms often persist and are likely to return (see Chapter 4).[3,5,6,29] This persistence often leads to fear and uncertainty that is not adequately addressed in most guidelines (see Chapter 2).[30,31] Because patients are told not to worry when symptoms inevitably continue or recur, their concern only grows.

Avoidance behavior, overprotection, and hypervigilance are hallmarks of the descent from acute to chronic pain (see Chapter 12). Flores et al have shown that "prospective intolerance of uncertainty" is a factor in this progression into vulnerability.[32]

Uncertainty is common but all too often doctors overpromise and underdeliver, thus leading to patient dissatisfaction. Simpkin and Schwartzstein state, "Although physicians are rationally aware when uncertainty exists, the culture of medicine evinces a deep-rooted unwillingness to acknowledge and

- Understand how biomechanics of the raw materials of the body influences stability
- Understand how behavior influences our pain tolerance and resilience to biomechanical stressors
- Understand how transferable motor learning depends on developing "problem-solving" skills, which are not inherent in traditional motor control training

"It is imperative in science to doubt; it is absolutely necessary, for progress in science, to have uncertainty as a fundamental part of your inner nature. To make progress in understanding, we must remain modest and allow that we do not know."

RICHARD FEYNMAN

Introduction

The pain science and biomechanical science approaches are complementary to one another. Yet, these have been unnecessarily dichotomized into opposing "camps." An "Ecologic Dynamics" framework for thinking about movement behavior allows us to think differently about biomechanical issues and disabling pain. The physical–cultural, behavioral, and biophysical domains are all relevant. In fact, with the World Health Organization's (WHO's) adoption of the International Classification of Function, Disability, and Health (ICF) paradigm, rehabilitation has shifted irrevocably from a medical pathology-based (doctor-centered) view to a functional–social/environmental-based (patient-centered) view (see Chapter 4 Fig. 4.6).

The medical rehabilitation approach has been developed to be prescriptive and highly linear, whereas the functional rehabilitation approach has evolved into one which embraces complex systems theory and is therefore multivariate. A pure biomechanical approach was a giant leap forward from the pathology approach; however, patients often need reassurance and general reactivation more than they need to replace structural pathology with a biomechanical attribution for pain. In many instances, such thinking only allows a new nocebo to flourish.

Nocebo Thinking

As Proust (Le Côté de Guermantes) said, "For each ailment that doctors cure, they produce 10 others in healthy individuals by inoculating them with the pathogenic agent, 1,000 × more virulent than all microbes—the idea they are ill."

Patient education is necessary, but as long as vested interests are not addressed, we will continue to be disappointed (see Chapter 1).[1–4] Both rich and poor countries suffer alike. Both fee-for-service and socialized medicine approaches come up short. Opiates and surgery clearly aren't the solution. We all see each other's failures. Learning how to give people tangible hope and an achievable plan by giving them a positive experience with movement is a major challenge.

Disability-adjusted life years because of low back pain (LBP) have increased 54% since 1990 (Fig. 5.1).[1] As life span has increased, this becomes a tremendous threat to the quality of our longer lives. Four out of five of the top sources of the modern disability burden are musculoskeletal—hip, knee, low back, and neck.[1] Biologic and chronologic ages are not equivalent. A modern question is "Can we address this disability burden, so people maintain a greater quality of life as they age?"

An evidence-informed approach is a necessary first step toward clinical efficacy but is not sufficient to ensure best practice. The individual's unique social setting and environment influence outcome in ways that require clinicians to personalize rehabilitation. Thus, best practice in rehabilitation is patient centered as well as evidence based.[5,6] A behavioral approach appreciates the value of how patient preferences, perception, and action are fundamentally linked, and therefore is at least as important as the diagnosis a person has.[7]

Best Practices

Evidence-based medicine, according to Sackett,[8] is an assimilation by healthcare providers (HCPs) where the best available research is "contextualized" in a patient-centered, precision manner to be relatable. This forges trust as a needs analysis from the history identifies the patient's unique individual, environmental, and social matches, preferences, values, beliefs, fears, concerns, attitudes, goals, expectations, etc. Following this needs analysis, the HCP is able to leverage their methods, systems, and experience to identify the most agile and relevant options to recommend to the patient to improve function.

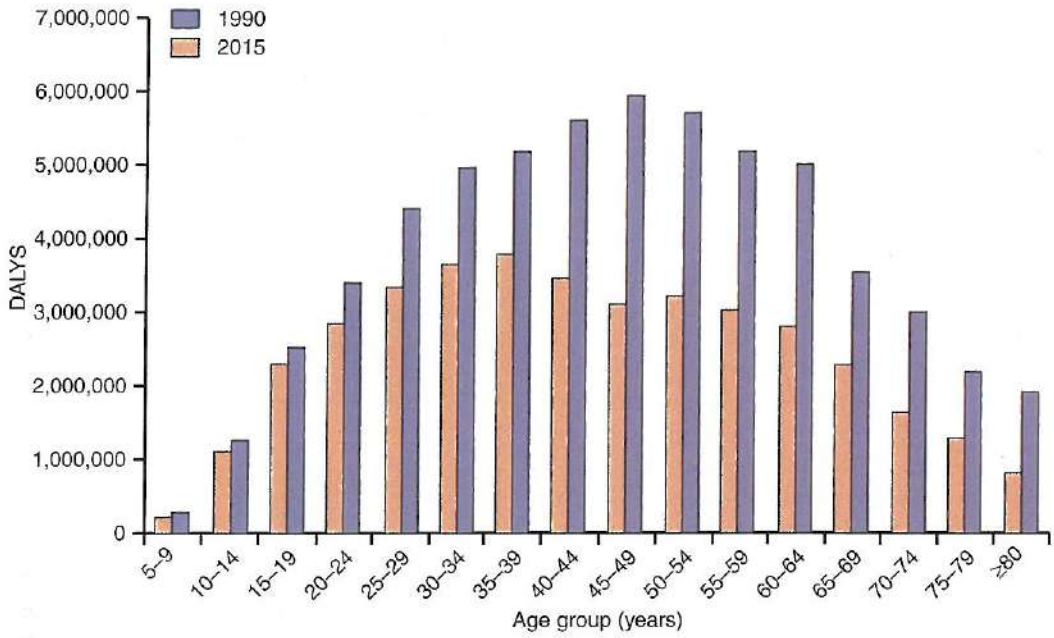


Figure 5.1 Global burden of low back pain, in disability-adjusted life years (DALYs), by age group, for 1990 and 2015. Reprinted from Hartvigsen J, Hancock MJ, Kongsted A, et al. What low back pain is and why we need to pay attention. *Lancet*. 2018;391(10137):2356-2367, with permission from Elsevier.

As we bridge the gap between the bio, psycho, and social components of disability, we can sharpen our focus by reimagining the framework in a broader context—"From Cell to Society" (Fig. 5.2).[9]

Dynamic systems theory (DST), gamification, behavioral nudges, etc. are all needed to address a modern crisis heavily influenced by vested interests. While uncomfortable for many HCPs who desire specified care pathways, an agile mindset is needed to handle the challenges of uncertainty when navigating the person-centered care.

Function

Function is that which is purposeful to the individual in a given environment. Historically, medical rehabilitation presumed that promoting physical activity (PA) was secondary to removal of pathology or treatment of symptoms.[7] However, an individual's activities create agency and defines who they are. Participation can often occur in spite of pathology or symptoms, just as it can be compromised in the absence of these. Therefore, both one's psychological coping strategies and social/environmental support have at least as much influence on successful participation at work, home, and in recreation as do biologic considerations.

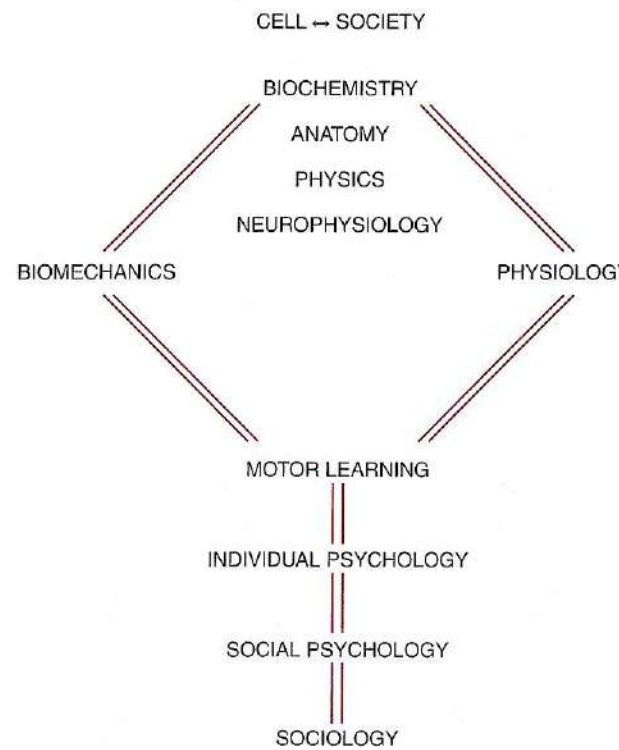


Figure 5.2 "From Cell to Society" kinesiology model. Adapted from Elliot D. Forty years of kinesiology: a Canadian perspective. *Quest*. 2007;59:1, 154-162.

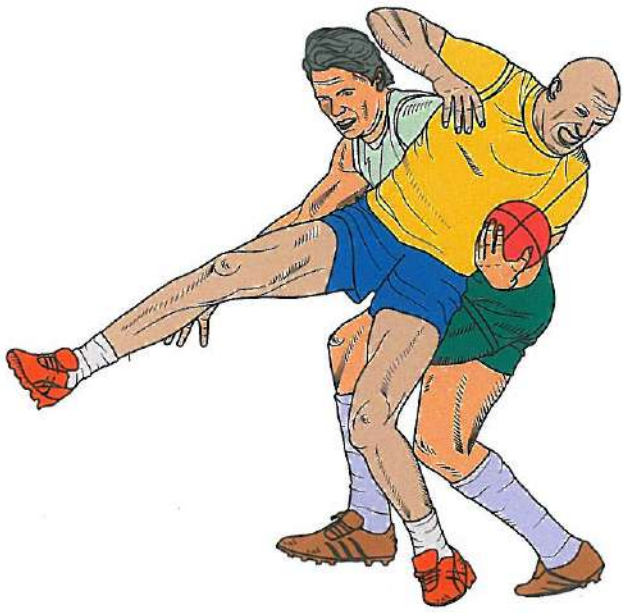


Figure 5.6 Sudden physical trauma resulting in injury.

been more challenging. Recent evidence suggests that such injuries are real and result from the spine buckling or exhibiting unstable behavior. But this buckling mechanism can occur during far more challenging exertions as well (Fig. 5.7).

A number of years ago we were investigating the mechanics of power-lifter spines while they lifted extremely heavy loads using video fluoroscopy to view their vertebrae in the sagittal plane. During their lifts, even though the lifters outwardly appeared to fully flex their spines, in fact their spines were 2 to 3 degrees per joint from full flexion, thus explaining how they could lift magnificent loads without sustaining injury—the risk of disc and ligamentous damage is greatly elevated when the spine is fully flexed (which the lifters skillfully avoided). We happened to capture one injury on the fluoroscopic motion film—the first such observation that we know of. During the injury incident, just as the semi squatting lifter had lifted the load approximately 10 cm off the floor, only the L2/L3 joint briefly rotated to the full flexion calibrated angle and exceeded it by one-half a degree, whereas all other lumbar joints maintained their static positions (not fully flexed).[110] The spine buckled! Sophisticated modeling analysis revealed that buckling can occur from a motor control error in which a short and temporary reduction in activation to one, or more, of the intersegmental muscles would cause rotation of just a single joint so that passive or other tissues become irritated or possibly injured.[111]

Adams and Dolan[112] have noted that passive tissues begin to damage with bending moments of 60 Nm—this occurs simply with the weight of the torso when bending over and a temporary loss of muscular support. This scenario is not an excessive task, but it is often reported to clinicians by patients as the event that caused their injury (i.e., picking up a pencil). However, reporting of such an event will not be found in the scientific literature. Medical personnel would not record this event because in many jurisdictions it would not be deemed a compensable injury—the medical report attributes the cause elsewhere.

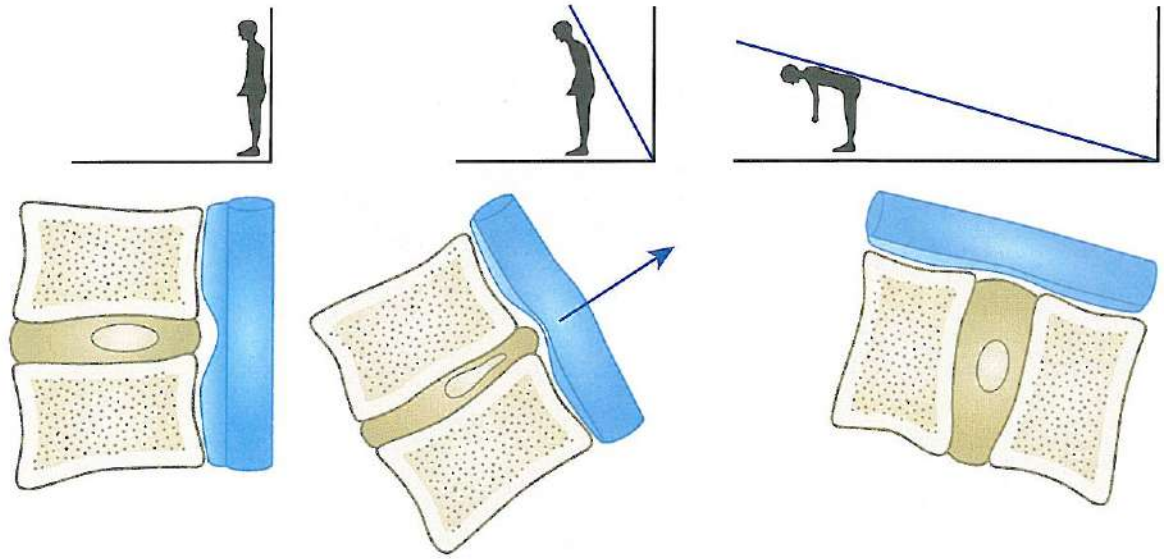


Figure 5.7 Lumbar disc mechanics.

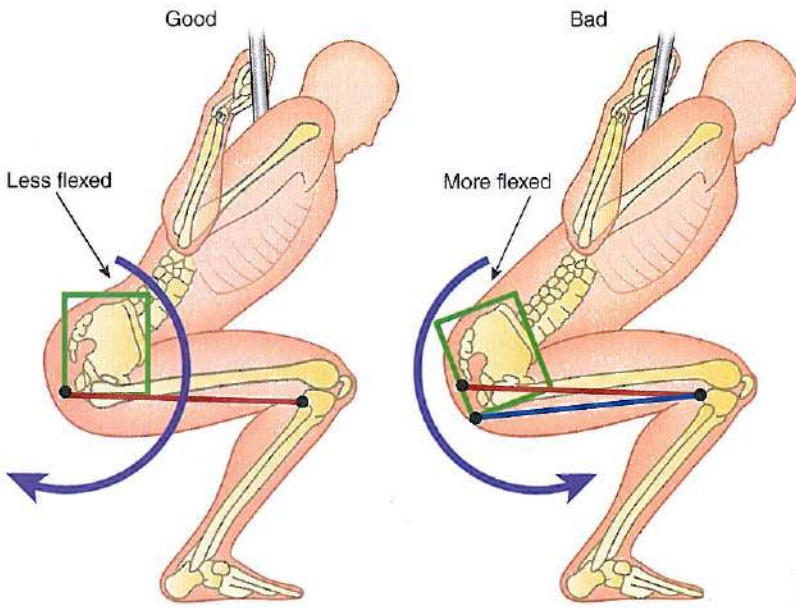


Figure 5.8 Neutral spine during squats.

In vitro, a ligamentous lumbar spine buckles under compressive loading at approximately 90 Newtons (approximately 20 lb) highlighting the critical role of the musculature to stiffen the spine against buckling (with the critical work and analysis of the passive tissues being performed by Crisco and Panjabi[113]).

Theories about bending with a neutral spine arise from this biomechanical perspective (Figs. 5.8 and 5.9).

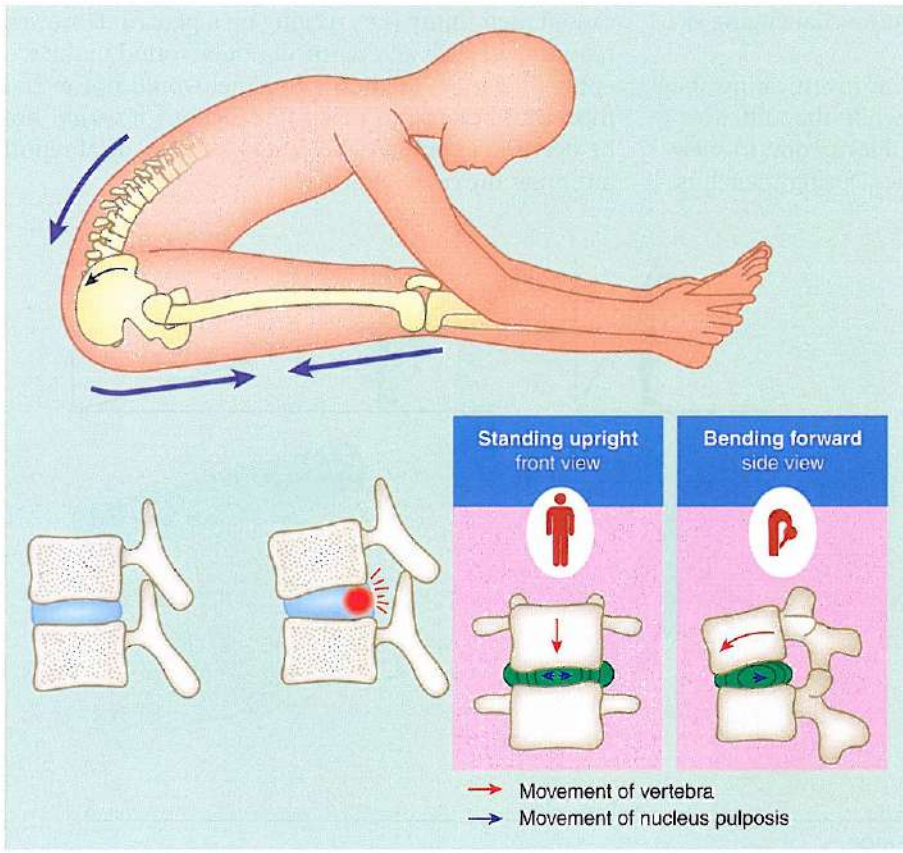
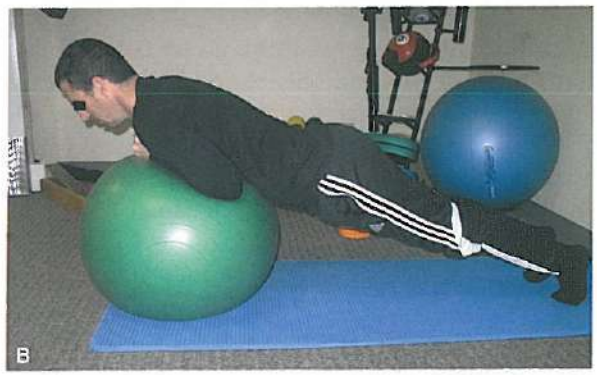


Figure 5.9 Stretching and proposed back mechanics.

Figure 5.46 Curl-up. From Liebenson C. *Functional Training Handbook*. Philadelphia, PA: Wolters Kluwer; 2014.



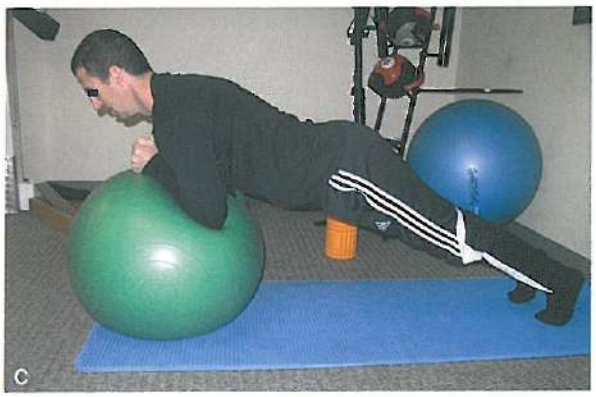


Figure 5.47 "Stir the pot." **(A)** Start position on knees. **(B)** Lift knees off the ground. **(C)** Press off the ball. **(D)** Move the ball up and down, side to side, clockwise, and counter-clockwise. From Liebenson C. *Functional Training Handbook*. Philadelphia, PA: Wolters Kluwer; 2014.

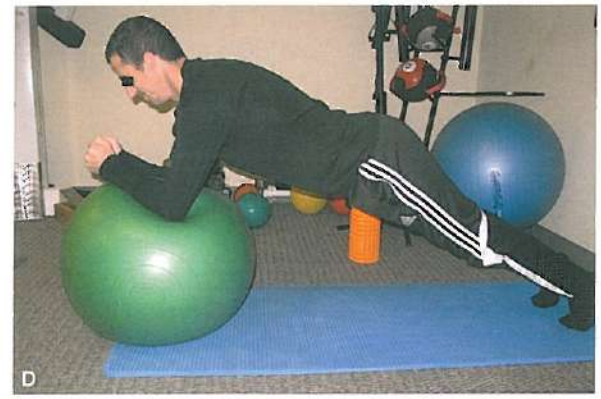


Figure 5.47 (*continued*)

Trunk extension is another example where spinal load data can influence clinical decisions.[116] The prone superman involves relatively high loads for a bodyweight exercise of 4,300 N (Fig. 5.48). The quadruped position is a much better choice for spinal extensor training. The bird dog exerts 3,000 N of force on the spine, whereas the quadruped leg raise between 2,000 and 2,300 N of force (Fig. 5.49). Another popular gym exercise that places the spine in a potentially deleterious position is the leg press machine (Fig. 5.50A). The lumbar spine is placed in kyphosis that adds potential strain to the posterior portion of the intervertebral disc. One biomechanical modification that will reduce lower back strain is to perform the leg press with one foot on the ground (Fig. 5.50B). Another option is to forgo the leg press altogether in favor of more stereotypical human movements.

Load Data Has Its Limits

- NIOSH limits are population based and are valid for this purpose in ergonomic contexts.
- However, they also give us a defensible benchmark to use in managing loads imposed by exercises and activities.
- We should bear in mind they do not tell us anything about an individual's tolerance for load; injury history, short- and long-term physical activity history, body size/proportions, spinal morphology, age, and sex are just some of the factors that are known to influence an individual's tolerance to spine flexion.

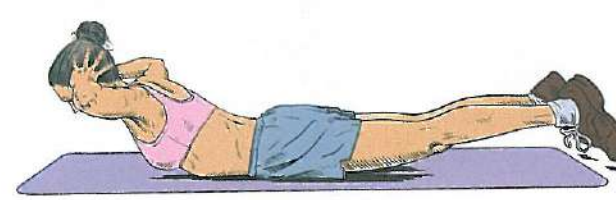


Figure 5.48 Prone superman. From Liebenson C. *Functional Training Handbook*. Philadelphia, PA: Wolters Kluwer; 2014.

Table 6.2 Typical Physical Findings Associated With the Most Common Lumbar Radiculopathies

Nerve Root Involved	Muscular Weakness	Sensory Loss	Reflex Effected
L4	Quadricep, tibialis anterior	Medial malleolus	Knee jerk
L5	Extensor hallucis longus	First web space of foot	Medial hamstring
S1	Gastrocnemius, soleus	Lateral malleolus	Ankle jerk

Nerve root pain commonly arises from a single nerve root and is associated with unilateral pain radiating down the leg in a distribution that approximates a dermatome. The pain can refer to the foot. Leg pain is often more bothersome to the patient than the back pain. The pain is often associated with numbness or paresthesia. There is usually no inciting event in the development of a lumbar radiculopathy, because over 60% of patients cannot recall anything out of the ordinary prior to the onset of their pain.[38] There are often specific physical signs of nerve root irritation such as myotome weakness, diminished deep tendon reflexes, dermatomal sensory loss, and dural stretch signs (Tables 6.2 and 6.3). The finding of leg pain in the contralateral leg with the straight leg raise test is a very specific test for neurologic irritation with a herniated lumbar disc.[15] This abbreviated neurologic examination of the lower extremities will allow detection of most clinically significant radiculopathy. This screening examination in the diagnostic triage may miss disc herniations in the upper lumbar region[39] (Fig. 6.2).

Table 6.3 Typical Physical Findings Associated With the Most Common Cervical Radiculopathies

Nerve Root Involved	Muscular Weakness	Sensory Loss	Reflex Effected
C5	Biceps, deltoid	Lateral arm	Biceps
C6	Biceps, wrist extensors	Lateral forearm	Brachioradialis
C7	Triceps, wrist extensors	Middle finger	Triceps
C8	Hand intrinsics	Medial forearm	
T1	Hand intrinsics	Medial arm	

In the cervical spine, an accurate diagnosis regarding nerve root involvement can be obtained through the patient's history 75% of the time.[40] Pain is often greater in the upper extremity than in the cervical region. The pain is often associated with paresthesia and weakness. Scapular region pain is common with cervical radiculopathy. A lancinating quality to the pain is often reported. The distribution of the pain depends on the nerve root involved. C1 and C2 radiculopathies are uncommon and can refer pain to the occipital and retro-orbital regions, respectively.[41] The C3 root refers pain to the ear and jaw regions. C4 radiculopathies refer pain along the base of the neck. C5-T1 radiculopathies are listed in Figure 6.2. Severe dermatomal loss of sensation is rare in cervical radiculopathies.[41] Loss of manual dexterity, gait instability, generalized weakness, or urinary symptoms are red flags for cervical myelopathy and require emergent imaging with CT or MRI (Fig. 6.3).

Some physical examination tests are advocated for the evaluation of patients with suspected cervical radiculopathy, often referred to as "special tests." Spurling neck compression test has high sensitivity but low specificity.[41] It involves axial compression with cervical extension and rotation, provoking upper extremity or scapular pain. Relief of symptoms with cervical traction or glenohumeral abduction also implies the presence of nerve root pathology (radiculopathy relief sign). Kemp test involves extension and rotation of the spine at either the cervical or lumbar area. Pain with this maneuver is purported to indicate pain emanating from a facet joint. A recent literature review indicates that this sign lacks diagnostic accuracy.[42]

In the patient with suspected nerve root compromise, close clinical attention is required to ensure no progressive neurologic loss or cauda equina symptoms develop. In the absence of red flags, patients with unilateral, unisegmental nerve root findings do not require imaging or other diagnostic tests in the first month of symptoms, as long as they improve with clinical treatment and time.[19] Most patients improve with or without treatment, with recovery from radiculopathy preceding shrinkage of the compressive lesion on MRI.[43] In patients with refractory nerve root compromise, diagnostic imaging is required to rule out nondisc-related nerve root compression, such as tumor or other space-occupying lesion. To evaluate for

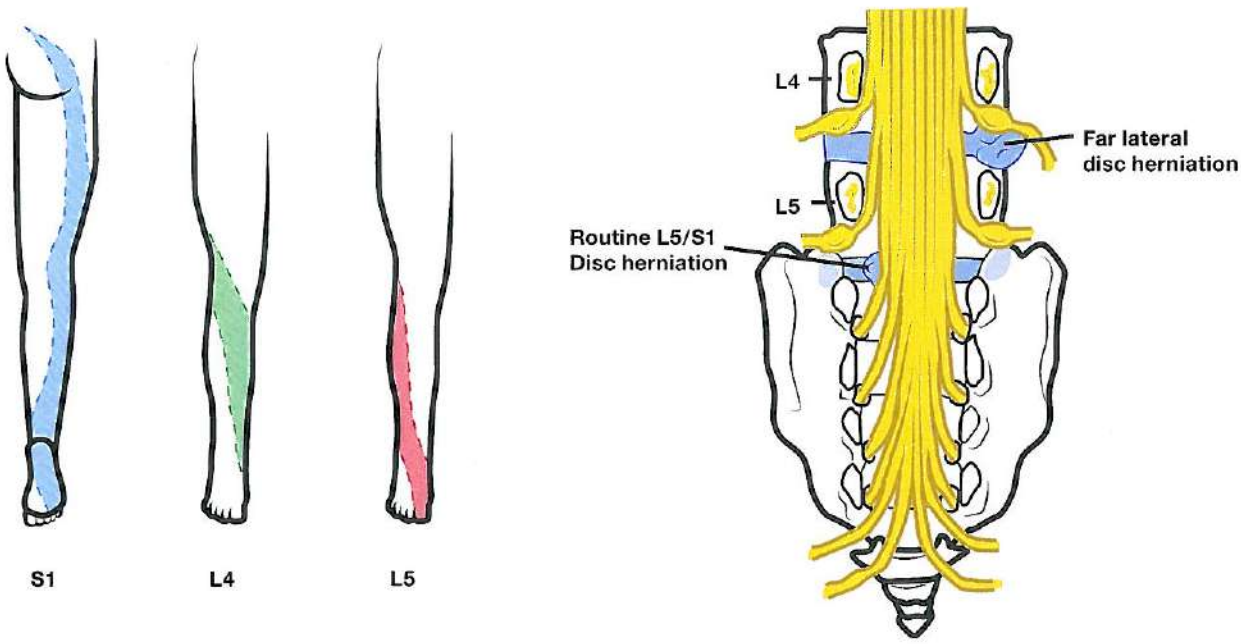


Figure 6.2 Lumbar dermatomes. Image: Thomas Murphy.

such abnormalities, the clinician can use CT or MRI. Most studies indicate no significant difference in the true-positive and true-negative rates for diagnosing lumbar disc herniation among CT, CT-myelography, and MRI.[15,44] Plain myelography was inferior to these three modalities. As any myelographic procedure can expose the patient to complications of postspinal tap headache, reaction to contrast media, and meningeal infection, the noninvasive modalities of CT and MRI are a superior choice for diagnostic triage of the patient with suspected herniated nucleus pulposus with nerve root compression.

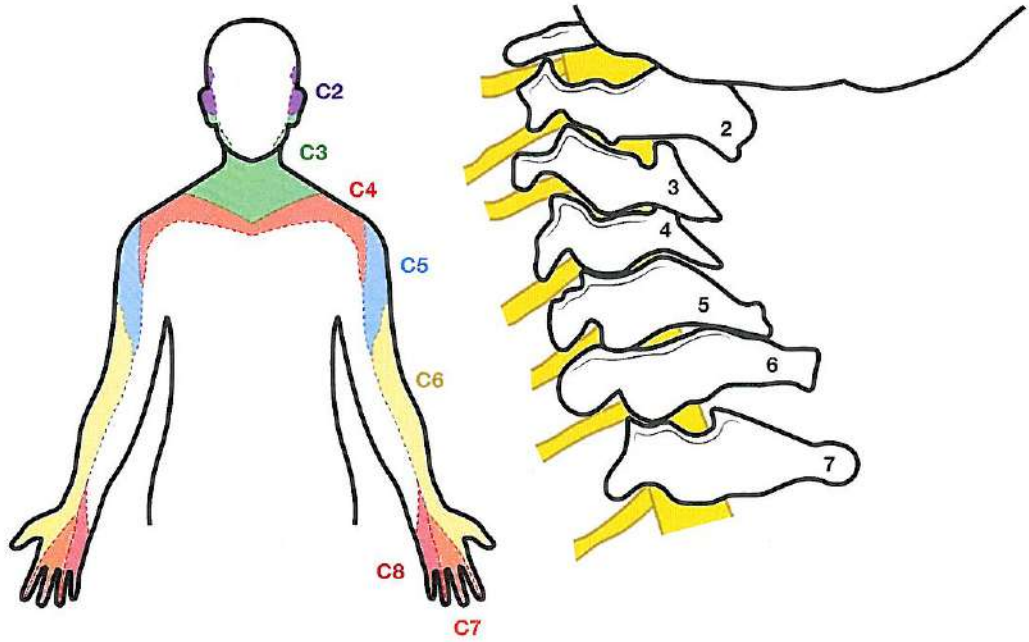


Figure 6.3 Cervical dermatomes. Image: Thomas Murphy.

Patient Position

- Prone
- Feedback unit is placed under abdomen with navel in the center and distal edge of the pad in line with right and left ASIS.
- Pad inflated to 70 mm Hg

Test

- Breathe in and out, and then without breathing in to slowly draw the abdomen in so it lifts off the pad (draw abdomen away from waistband of pants).
- Don't change spinal position.
- Then breath normally without losing the drawing-in maneuver.
- Try for a few repetitions to be sure the patient has given it their best shot.
- Perform 10 times.

Quantification

- Fail if more than 10 mm Hg decline in cuff pressure or less than 4 mm Hg drop in cuff pressure during 10-second hold (a 4–10 mm Hg range is acceptable)
- Fail if thoracolumbar hypertonus, lumbar extension, posterior pelvic tilt, or breath holding occurs

Cervicocranial Flexion Test of Jull This test[137,138,181] is illustrated in Figure 10.17.

Pretest Routine

- Supine patient with knees bent and feet flat (crook lying)
- Ask patient to move their head as if nodding "yes" (cervicocranial flexion).
- If the movement occurs with head retraction or lifting of the head, then passively model the appropriate movement. Active assistance, large amplitude movements, or eye movements may

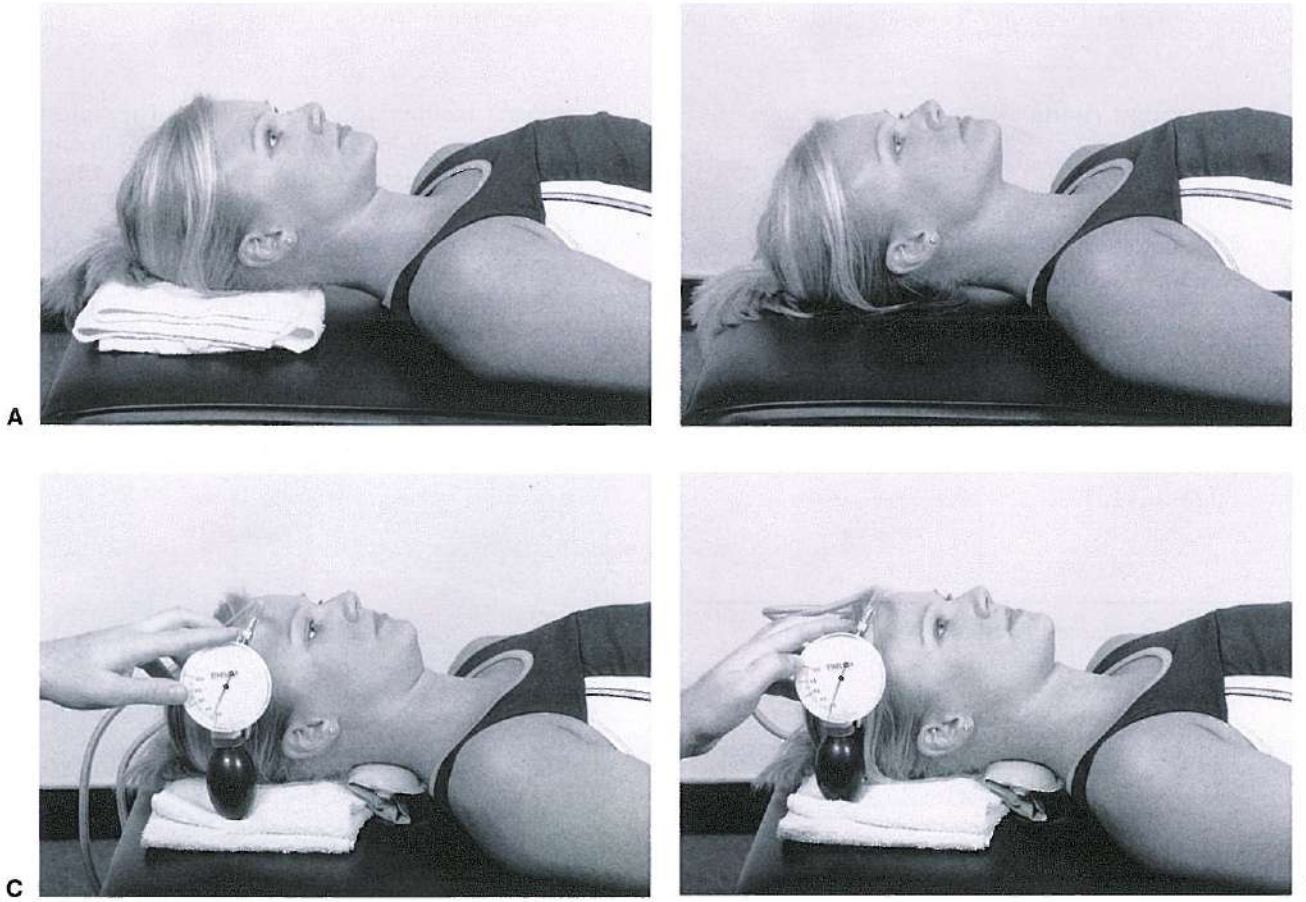


Figure 10.17 Cervicocranial flexion test of Jull. **(A)** Incorrect head/neck alignment. **(B)** Correct head/neck alignment. **(C)** Beginning position with stabilizer cuff inflated to 20 mm Hg. **(D)** Successful nodding motion to 28 mm Hg.

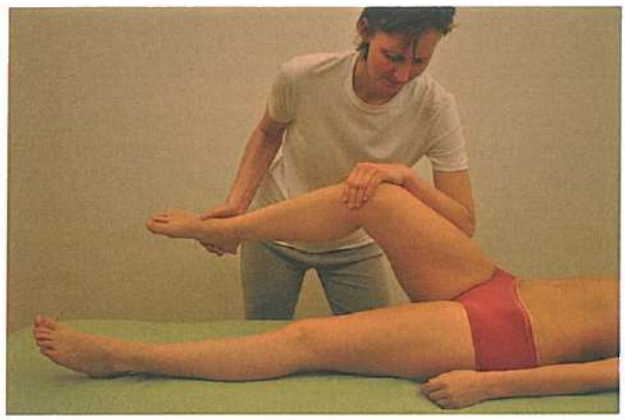


Figure 11.18 Piriformis.

0 no limitation of adduction and internal rotation and a soft, gradually increasing resistance is noted at the end of the range of motion

1 adduction and internal rotation are limited

2 adduction and internal rotation are limited, the hard end-feel is on the end of range of motion

Quadratus lumborum is difficult to examine because this muscle spans many spinal segments.
Position: Passive trunk side bending is tested while the patient assumes a side-lying position (Fig. 11.19).
Evaluation: The reference point is the level of the inferior angle of the scapula.

0 the point is raised 2 inches from the table

1 the point is raised 1 inch from the table

2 the point is raised less than 1 inch from the table

Figure 11.19 Quadratus lumborum.

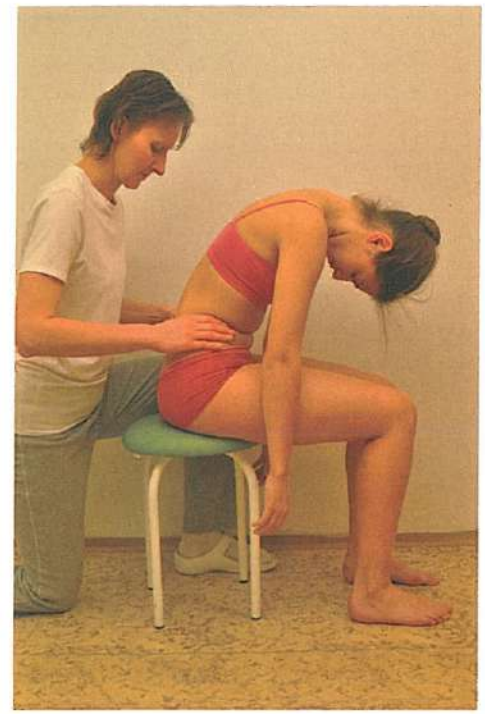


Figure 11.20 Erector spinae.

A simpler screening test entails observation of the spinal curve during active lateral flexion of the trunk.
Spinal erectors are also difficult to examine for the same reason as the quadratus lumborum. As a test, forward bending in a short sit allows observation of the gradual curvature of the spine.
Position: Patient sits on chair, the hips are at 90 degrees flexion (Fig. 11.20).
Fixation: To control the pelvis, therapist stops the trunk flexion when the pelvis starts to move forward.
Evaluation: The distance is measured between femur and a forehead.

0 the distance is less than 4 inches

1 the distance is between 4 and 6 inches

2 the distance is more than 6 inches

Triceps Surae

Position: Gastrocnemius and Soleus: Patient lies supine, the tested leg is one-third off the table (Fig. 11.21).
Fixation: Forefoot is held on lateral side, whereas the other hand provides a traction force on the calcaneus.
Evaluation: First phase is done by performing passive dorsiflexion of the foot with knee in extension.

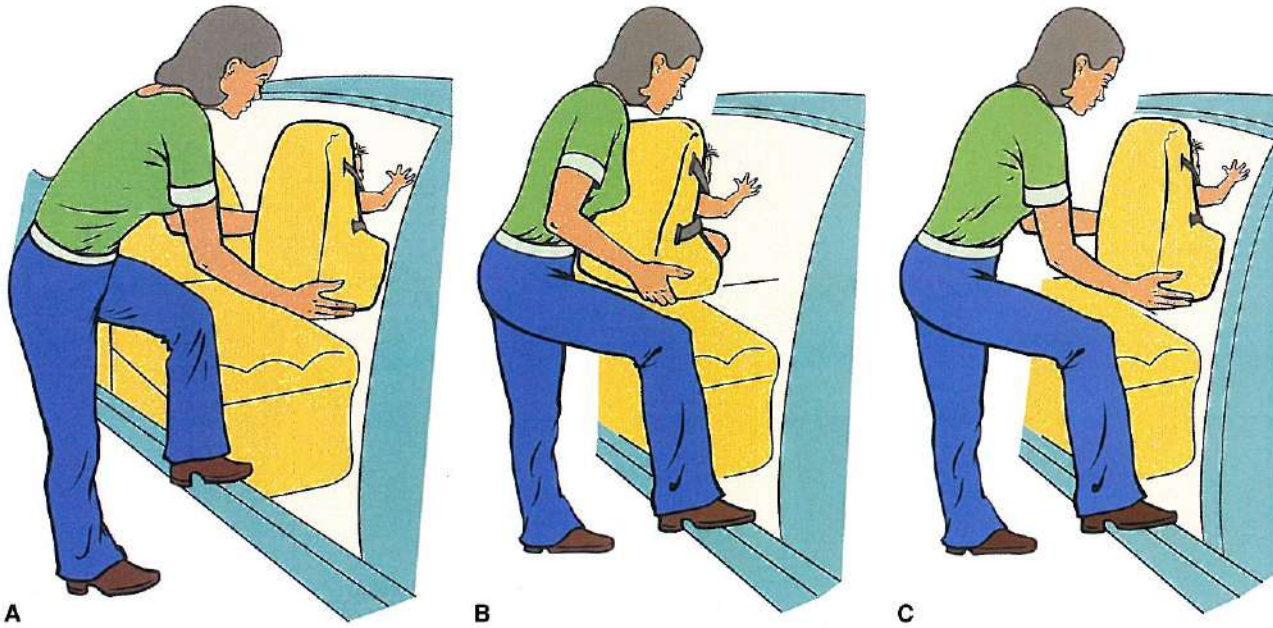


Figure 14.26 Placing a baby in a car: (A) incorrect reaching position, (B) correct holding position, and (C) correct reaching position.

end range flexion loading of the spine has been shown to occur as a result of a fatiguing repetitive task such as lifting.[128]

Most low back injuries occur because of repetitive micro-trauma and not any one singular event. For instance, repeated small loads (e.g., bending) or a sustained load (e.g., sitting) can gradually irritate the spine. According to McGill, it is usually a result of "a history of excessive loading which gradually, but progressively, reduces the tissue failure tolerance."[129]

In particular, low back injury has been shown to result from repetitive motion at end range (see Chapter 5). Disc herniation has been shown to be related to repeated flexion motion,[130] especially if coupled with lateral bending and twisting.[131,132]

What appears to be an attainable goal is the maintaining of lordosis, independent of thigh and trunk angles.[129] Adams and Hutton reported that compressive loads on a fully flexed lumbar disc (i.e., stooped posture) cause posterior herniation of nuclear material

Figure 14.27 Driving: (A) incorrect and slouched, (B) correct and upright, and (C) correct with a wedge support.

4. Suitcase Carry

Indications

- Inadequate lateral core stability for resisting external forces/perturbations
- Inadequate single-leg balance/stability
- Subacute or chronic unilateral LBP

Procedure (Fig. 19.47A and B)

- Stand upright (shoulders packed, core braced) with neutral spine posture
- Hold weight (kettlebell, dumbbell) in one hand
- Walk for a pre-set distance maintaining neutral posture

Progression

- Labile load: perform suitcase carry holding onto one end of resistance band, with weight looped through other end of band. Resist perturbation rom band during the walk (Fig. 19.48A and B)
- Suitcase march: perform suitcase carry with high knee march (flex hip to 90 degrees)
- Asymmetric carries: try different combinations of holding one kettlebell in each hand (either of same or differing weights). Such as one hand racked/one hand suitcase (Fig. 19-49A), one hand overhead/one hand suitcase (Fig. 19-49B) or bottoms-up version (Fig. 19-49C)

Evaluation

Errors

- Leaning to one side (Fig. 19.50)
- Spinal hyperextension
- "Drunk walking" (unstable steps)
- Bent support leg

Patient Audit (What the Patient Should Feel)

- Strong contraction of obliques and glutes
- Enhanced stability when walking (post exercise)

Troubleshooting

- Irradiate grip with both hands
- Single-leg balance
- Practice proprioception of neutral spine without lateral bias

Figure 19.47 Suitcase carry. (A) Front view. (B) Side view.

Figure 19.48 Suitcase carry w/labile load. (A) Front view. (B) Side view.

Figure 37.1 Individualized conservative care clinical framework.

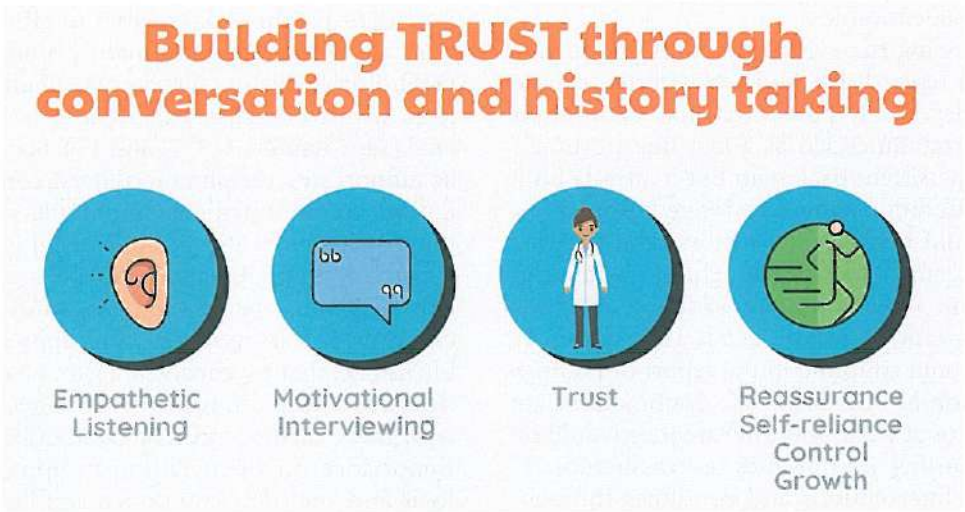


Figure 37.2 Building trust in the clinical setting.

Evidence-influenced (or informed) care is often described as a tripod, a balance of the best available research, clinician experience, and patient beliefs and values. Without each of these three legs, there is no way the stool would stand. Sackett, the godfather of the evidence-based movement, says, "Clinical expertise should be informed but not replaced by evidence."[10] Those who overemphasize one aspect of this at the expense of the others do their patients a disservice. The bulleted text is an example of overemphasis of clinician experience and attitudes. Similarly, some take peer-reviewed published research to the same extreme. They believe if it has not been proven and published, it cannot be true or effective. Although the authors believe that understanding the best available research is essential, there are clearly cases within conservative NMS care where a more artistic approach is required. Perhaps the manual medicine pioneer, Karel Lewit said it best, "We work at the acceptable level of uncertainty." This quote has such eloquence because it clearly implies that being uninformed is not acceptable, but that proceeding with certainty is something typically seen in sophomoric clinicians and simple cases. Uncertainty and humility go hand in hand. Knowing that one does not know places the clinician in the best position to passionately pursue evidence to help inform patient care and strive to reach a patient's goals with approaches that can produce sustainable, resilient outcomes (see Chapter 1). We should expect uncertainty as the rule rather than the exception and to overcome it, the clinician will be most successful when balancing the tripod with best evidence, clinician experience, and patient values.

While discussing the evidence and efforts to further back pain research by the *Lancet*, in his critique Lorimer Moseley keenly points out that, "Education is universally recommended as a first line treatment for acute and persistent back pain but it attracts little attention."[11] Education should be layered throughout the CF; it should begin in the history with the way questions are framed and the thoughtful exploration by the clinician. The second part of this chapter addresses the education in more detail as do Chapters 13 to 16. It should continue in the report of findings with explanation of why diagnostic examinations are being ordered or at what point in care they would be appropriate. Further it continues as reassurance regarding active interventions and continues throughout the exploration of movement and appropriate self-care strategies.

The framework also includes promoting self-efficacy through early active interventions and emphasizes patient-specific functional goals (Table 37.1). In the McKenzie method, the early application of self-directed strategies for patients creates valuable self-attribution. The key factors of clinical success are having an internal locus of control, a growth mind-set, and grit (Fig. 37.3). Those who believe they have control (internal locus of control) and autonomy have better health care outcomes[12,13] (see Chapter 17). It has been shown that having control, or even the illusion of control, has an impact on mind-set, which can be important for helping a patient remain optimistic during a difficult time.[14] Being able to overcome adversity, such as an injury, is best accomplished with grit, which is a combination of both passion (think: goals and motivation creating a consistent direction) and perseverance (think: resiliency and longevity of effort even during tough times).[15] The resilient mind-set is focused on building activity tolerance rather than a reactive process focused on palliative measures. This is the sustainable answer to our modern disability epidemic (see also Chapter 38).

Table 37.1 The Clinical Framework

1. Evidence based
2. Outcome based
3. Biopsychosocial
4. Promoting self-care
5. Focused on the patient's functional goals

Part of early active intervention is recognizing the impact of psychosocial factors in clinical care. Even in a case, which is predominantly biologically driven, psychological factors such as patient attitudes, beliefs, fears, worries, and past experiences need to be considered (see Chapters 1, 3, 7, and 13). Social factors such as support structure, financial need/concern, work situation, community behavioral nudges, and living arrangements must also be considered (see Chapter 1). When contemplating psychosocial factors, a balanced approach must be applied. Regretfully, many NMS clinicians fail to recognize and appreciate the notable impact that psychosocial factors have on their patient's condition. At the other extreme, those familiar with these factors can mistakenly place an outsized importance on them failing to appreciate the biologic and anatomic components of the patient's condition. Looking at these examples more specifically on one side, we may have the clinician who, while well meaning, provides iatrogenic words to the patient. This can be in the form a structural diagnosis

Figure 37.3 Factors of clinical success.

the patient takes too seriously (the bulging disc) or the seemingly eloquent functional diagnosis (inhibited gluteals impairing gait) that the patient fails to understand or gain control of. The other example would be a nihilistic application of pain science, where the clinician deemphasizes the physical reality of the pain, and presents only a top-down central neurologic approach that the patients fails to grasp and appreciate. The authors strongly suggest a moderate and eclectic approach—one where the clinician strives to identify and value psychosocial considerations, but aims to apply their expertise in biology and neurology leveraging these factors to create psychosocial change rather than falling into the trap of becoming an "arm chair psychologist." Guidance as to the relative importance of peripheral nociception or central mediated pain can include the fact that acute injuries tend to have larger contributions from peripheral nociceptive input and chronic issues tend to have a larger representation from the output of central sensitization. For cases where the psychosocial components are primary and they need to be addressed directly, referral to appropriate specialists and creation of a multidisciplinary care team is likely the most prudent approach.

Specific functional goals are mutually determined by the patient and the clinician; they represent the patient's tasks and activities, and are objectively measurable. Goals should be SMART: Specific, Measurable, Attainable, Relevant/Relatable, Time bound. This allows tracking during reassessment periodically throughout care to remind the patient of their goals and progress to date. Other specific functional outcomes tools can be used such as the Patient-Specific Functional Scale (PSFS), which is the most individualized of the outcome assessment tools.[16,17] Other tools were discussed in Chapter 8 that, using reliable, valid, and sensitive measures, help us track impairment, patient activities, and participation in work. Functional goals should relate more to activities and participation than to impairments[18] (see Chapter 38). However, short or intermediate goals might include the impairments. For continued clinical success, it is important that periodic goal revision is performed by the clinician and the patient.

As the CF has many important aspects, questions often arise about how to apply it to clinical cases. The next section will walk you through some common questions and clinical challenges.

Clinical Challenges

The CF outlines a modern clinical thought process whose goal is to empower patients and minimize chronicity and disability. This section describes several action steps for HCP trying to refine and implement utilization of this model (see Table 37.2).

As the clinician goes through each of these action steps, they can be recorded in the patient profile. This allows an at-a-glance look at the essential pieces of the framework: goals, activity intolerance (AI), mechanical sensitivity (MS), abnormal motor control (AMC), and current active self-care (Fig. 37.4). This quick

Table 37.2 Clinical Challenges

While applying the clinical framework are you ...

History

1. Identifying patient fears, worries, and goals?
   Then offering reassurance.
2. Identifying activity intolerances (AI)?
   Establishing mutually agreed upon functional goals.
   Striving for goals related to activities of daily living (ADLs), work, training, sports, and/or recreation.
3. Identifying mechanism of injury (MI)
   Recommending and training sparing strategies

Examination

4. Identifying mechanical sensitivity (MS)
5. Identifying relevant abnormal motor control (AMC)

Rehabilitation

6. Can you prescribe a safe and effective active intervention that improves both MS and AMC?
7. Can you prescribe exercises to groove patterns creating stability and robustness?
8. How do we progress exercise ensuring transfer and retention so it will benefit the patient in their ADLs, sport and occupational activities?
9. What role should psychosocial factors play in a case that it is a mixture of biological factors and psychosocial complications?

overview is particularly helpful to facilitate efficient communication in multi-practitioner settings or when coordinating treatment and training.

Clinical challenges involving common questions regarding the framework and serving to allow further exploration of this model are presented.

Clinical Challenge 1a

Can you uncover from the patient's history what their fears, worries, concerns, and goals are?

Most people cope with pain without seeking health care.[19] Patients typically seek care when pain begins to impede their ability to function in work, at home, in social or athletic endeavors. The other event is when their condition is worsening, failing to improve, or has become severe enough to create fear, worry, and/or concern. The concerns and fears can have a broad range; they may include fear of ominous pathology, such as cancer, or they may include fear of losing one's job or ability to provide for their family.[20] Patients often fear that they may need surgery or that the wrong movement will significantly worsen their condition.[21,22] For others, it is something more benign but just as terrifying, the thought of losing the ability to participate in a beloved activity such as tennis or jogging. In short, this begins to identify the "why" behind the "what" type of care the patient needs. Unpacking the patient's psychosocial framework is a crucial part of taking a history (Fig. 37.5).

To address this, patients need reassurance and general reactivation advice. This includes identifying the pain generator, explaining provocative movements and positions, and a prognosis of how long healing and recovery may take. In order to adequately provide this type of advice, one must first identify key factors within the patient's verbal report of the history. Listening for key phrases and the terminology used to describe their condition can be helpful. Consider the differences in the following:

A	It feels like it's been here forever.	I've had this for 3 years.
B	I can't do my work (e.g., lift boxes) with this pain.	I can't do anything with this pain.
C	I have degenerating discs.	I think I aggravated my disc again.

In considering situation A, the *permanency* expressed is key. We are concerned not only with the true duration of time the chief complaint has been present, but also with how accurately, or, more precisely, how stable, the patient views it. Other expressions such as "I've always had this" or "I'll have to live the rest of my life with this" also express permanency. The more permanent it is perceived to be, the more challenging it tends to be from a psychological perspective. Patients who view their issues as more transient and temporary in nature are typically better able to accept and adapt.[23]

Figure 39.44F1 Peterson step down, start position.

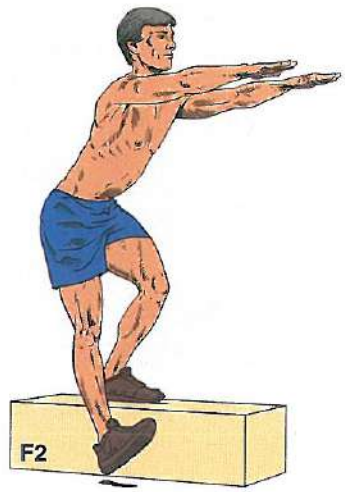


Figure 39.44F2 Peterson step down, finish position.

Figure 39.44G Step-ups.

Figure 39.44H1 1 leg gluteal bridge, start position.

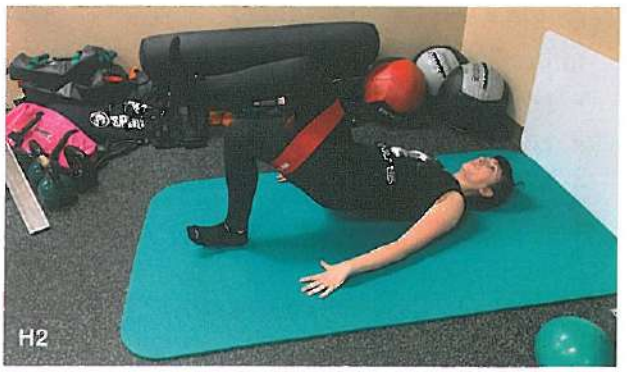


Figure 39.44H2 1 leg gluteal bridge, finish position.

Figure 39.44I1 Reverse lunge slider with heavy band pulling medially, start position.

Figure 39.44I2 Reverse lunge slider with heavy band pulling medially, finish position.

Figure 39.44I3 Reverse lunge slider with heavy band pulling anteriorly.

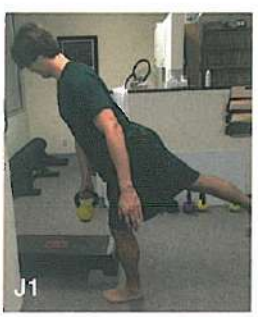


Figure 39.44J1 1 leg Romanian deadlift (RDL) with support, start position.

Figure 39.44J2 1 leg RDL with support, finish position.

Evaluation for Shortening

- Laterally bend and rotate head away from tested side.
- Apply gentle pressure to ipsilateral shoulder.
- Positive test is lack of resiliency when pushing on shoulder.

Joint Dysfunction

- C1/C2 and C2/C3
- Cervicothoracic junction

Corrective Actions

- Using a headset
- Rearranging computer monitor or reading material so that head does not need to be turned
- Facilitate and strengthen the lower fixators of the scapulae.

PIR Technique (Fig. 29.39)

Patient Position

- Supine
- Head and neck are flexed, rotated, and laterally flexed away from the side of the target muscle.
- Arm on involved side is relaxed at the patient's side.

Doctor's Position

- At the head of the table on the side of involvement
- Crossed or uncrossed arm contact with one hand supporting the patient's head while the hand contacts the patient's superior-medial border of the scapulae
- Patient's neck is maximally flexed, then laterally flexed and rotated away from the involved side.
- Take out all the slack in the direction of the shoulder depression and minimize forces on the head and neck.

Patient's Active Effort

- Patient is instructed to gently elevate the shoulder blade toward the head.
- This effort is resisted by the doctor so as to keep the contraction isometric.

Direction of Muscle Lengthening

- Once the patient has fully relaxed, the doctor takes out the slack with shoulder depression.

Self-Stretches Self-stretches are the same as the upper trapezius except the upper neck is supported in contralateral rotation (Fig. 29.40).

Figure 29.39 Levator scapulae post-isometric relaxation.

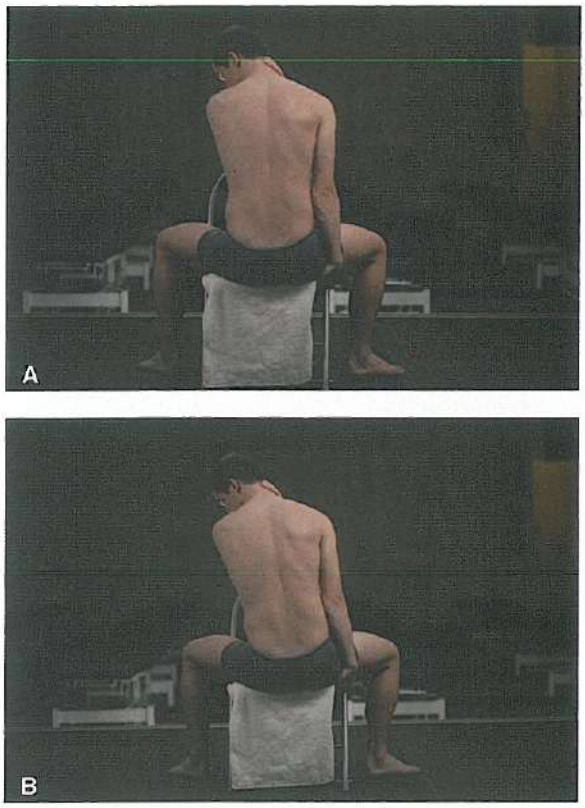


Figure 29.40 Levator scapulae self-stretch. **(A)** Start position. **(B)** Lengthening.