Physical Therapy Solutions to the Low Back Pain Conundrum

DUFFY RATH SYSTEM©
LEADING THE WAY IN MSD PREVENTION
SINCE 1984

Presented By:

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Our mission is the prevention of musculoskeletal and lifestyle-related disorders and disability through education, training, and research.

This 2-day workshop is sponsored by the Montana Chapter
American Physical Therapy Association
Bozeman, MT April 29 – 30, 2023

APTA Montana

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Brief Biography: Wayne graduated from West Virginia Wesleyan College with a degree in Sociology/Psychology, and then the Physical Therapy Program at Downstate Medical Center – SUNY in Brooklyn in 1975. His early training in Orthopaedics was with Cyriax, Mennell, the 'Norwegian Approach', and McKenzie. He developed the Orthopaedic Unit for the PT School at Kean College/UMDNJ, Clinical Assistant Professor in the PT Dept., Thomas Jefferson University in Philadelphia. and an Active Teacher for the American Academy of Family Physicians. He is a co-founder of 3 Orthopaedic Study Groups in New Jersey, the Orthopaedic Section for the NJ Chapter APTA (first in the nation) and was a SME for the development of the national APTA Orthopaedic Section. He is a founding member of the McKenzie Institute and the first faculty member selected to replace Robin McKenzie at an International Conference for patient demonstrations (Cambridge, England 1995). He is a co-author of the McKenzie Institute credentialing examination, the Part C course, the integrated Part D course, the Physician's Course amongst many other workshops, conferences, and accolades for that organization (1982 – 1998). He helped to introduce the Mulligan Method to North America and Europe. Wayne has remained in private practice since 1978. Currently the focus of his practice is the implementation of the Duffy-Rath System© (DRS) for musculoskeletal wellness, MSD prevention, and ergonomics. The DRS is implemented at many companies throughout the United States, continuing to grow based upon 'word-of-mouth' marketing. Jean is the Director of prevention services and CEO of the practice. Wayne is the Director of research, ergonomics, and continuing education. Their home-base is in the shore community of Barnegat Light, NJ. They provide DRS training and close management for their PT Prevention Leaders as new contracts are obtained. Contracts tend to last many years enabling the DRS to integrate into the culture, with their longest contract approaching 30 years. This has enabled them to have a significant impact on the musculoskeletal health and wellness of tens of thousands of individuals – achieving the DRS mission. Wayne is a Member of the APTA (Orthopaedic Section), North American Spine Society, Chartered Institute of Ergonomics and Human Factors, and Institute of Industrial and Systems Engineers. In a randomized survey in 2004 Wayne was selected by his peers as one of the 20 most influential clinicians in Orthopaedic Manual Therapy. In 2014 Wayne and Jean published; "Duffy-Rath System An Introduction: a prevention-based approach for cumulative musculoskeletal disorders and disability – clinician's edition." More information about the DRS can be obtained at: http://duffyrath.com.

SECTION ONE

Abstract: Low back pain (LBP) disorders specifically, and musculoskeletal disorders (MSD) in general are the most prevalent, costly, and impactful health care problems affecting adult quality of life. They are the leading cause of chronic pain and limited activity in adults of all ages. This workshop addresses the following conundrum: ***"Although research evidence that activity and exercise is critical to the prevention and management of low back pain disorders, the most common reason for limited activity and exercise avoidance is a low back pain disorder."*** This workshop addresses prevention-based strategies to avoid or overcome this conundrum using the principles and general guidelines of the Duffy-Rath System (DRS). The workshop starts with a multidisciplinary review of the literature, definitions of terms used, and the basics of a clinical assessment that leads to a customized intervention with a long-term, prevention-based focus. All "schools of thought" are welcomed and encouraged to identify common factors with the DRS approach. The workshop leader shares > 40 years of experience in developing successful prevention programs in multiple occupational and clinical settings and builds a case for Physical Therapy to occupy the leading role in musculoskeletal disorder and disability prevention.

Goal: To promote a prevention-based approach to the assessment, treatment, and prevention of activity-related musculoskeletal disorders and disability by addressing how physical therapy contributes to solving a series of activity-related problems created by lower back pain. This workshop will illustrate how this is optimized through independent practice.

Objectives: the participant at the end of the workshop will be able to:

- Define the role of a prevention-based physical therapy approach to a spectrum of activity-related low back pain (ARLBP) disorders.
- Identify the basic clinical characteristics that distinguish common sub-groups of ARLBP disorders.
- Perform the basic examination procedures needed to identify the presence or absence of signs that distinguish the sub-groups.
- Demonstrate application of an activity-focused therapeutic procedure to gain control of the relevant signs and symptoms of a sub-group through patient simulation.

Foreword: I am very happy to return to Montana and appreciate the opportunity to share our ideas and experience helping people affected by LBP. I have taught many courses in Montana over the years and have always found the Physical Therapy community here to be independent-minded and activity, function, and certainly outdoor oriented – 'music to my ears'. Our practice has morphed into a pure prevention-focused endeavor, and we are involved in many companies and organizations throughout the United States. We are seeing more people discharged from healthcare services with incomplete resolution of their musculoskeletal problem, inadequate education, and training to complete recovery, nor how to remain active to their potential for the rest of their life – consequently, we see too many people who are pessimistic about their physical future. This adds to the "musculoskeletal conundrum", and in our opinion is iatrogenic. It is our

mission to do whatever we can within our sphere of influence to avoid or minimize the consequences of this. Physical therapy is well positioned to play a major role in helping to reduce the burden of activity-related musculoskeletal disorders through strategies that mitigate risk factors associated with inactivity and exercise avoidance.

Introduction & Background

It has been well known for many decades that low back pain (LBP) disorders are a major healthcare concern. It is the most prevalent musculoskeletal disorder (MSD), is the costliest work associated injury and leading cause of workdays lost, and regardless of occupation or employment is the most common cause of limited activity in middle-aged adults. The resulting beliefs, behaviors, and actions can have serious long-term effects. This is a contributing factor in chronic musculoskeletal pain, as well as other chronic health conditions. Kinesiophobia, an important area of research that originated within the Physical Therapy profession, needs to be addressed from a prevention-based strategy.

In 2002 at the Combined-Sections meeting of the APTA I proposed that preventative care is true healthcare – treatment is illness care with the intent of returning to health (Rath 2002). This is as true today as it was then, and the focus of this workshop. Low back problems are the perfect place to start crafting a prevention-based approach for MSDs – whatever works for LBP can be modified to work for the other regional musculoskeletal problems.

I have chosen to approach these 2-days by addressing this "Musculoskeletal Conundrum" Jean and I identified many years ago. However, for this workshop we refer to it as the "LBP Conundrum".

Discussing the LBP Conundrum

The varying impacts and effects of LBP on individuals are wide ranging. No one discipline has all the answers; therefore, we need a multidisciplinary perspective to understand how to best assess and serve our patients and clients. As physical therapists we have a unique position that links diagnostic and nosological skills with those addressing restoration and maintenance of biomechanical health and physical performance capabilities (function). However, we need to understand the context of the individual's LBP problem to optimize care; this can be very complicated and the main obstacle to achieving a good outcome, e.g., the potential negative impact of work-life-conflict (WLC) as a major risk factor for chronic pain and disability (Hämmig 2011). Our premise for this workshop is that a safe, acceptable, and sustainable return to an individual's normal or higher level of physical activity (home, work, and play) is the most important factor in outcome determination.

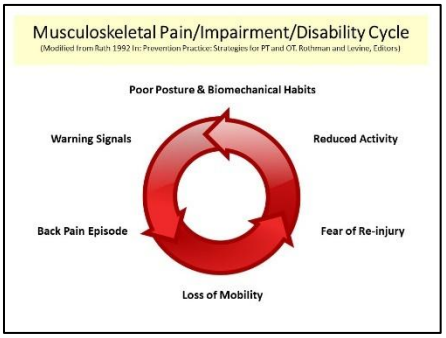
There are many reasons an individual would avoid physical activity and exercise because their back hurts or has hurt previously. These fall into different groups of reasons, i.e., those internally generated by the individual, externally generated by others, some combination of both, and/or other reasons altogether? It is important for the practitioner to determine, as best as possible,

what the most relevant reasons are that have led to or could eventually lead to activity and exercise avoidance.

The DRS philosophy has always been to keep people as active as is reasonably possible while recovering from an episode. We initially conceived the concept of "Tools To Fight Back®" (TTFB®) to encourage people to think of posture, biomechanics, exercises, and activity as a means of controlling a back problem and learning how to prevent recurrence. To many this was counterintuitive, especially when the medical profession often promoted rest and passive approaches to managing LBP. The unqualified concept, "if it hurts don't do it" can have many negative effects on one's beliefs, habits, actions, and behavior going forward.

We have repeatedly found that when patients are inactive (i.e., out of work, or participating in < 50% of their normal daily activities) they require more visits and weeks on program to achieve a good outcome and are less likely to be completely symptom-free at time of discharge (Rath 2014). It is easier to guide an individual in the right direction for complete, sustainable recovery when they have remained active and/or at work despite their problem from the start.

The evidence supporting the benefits of activity and exercise for both prevention and treatment of low back pain conditions is strong and has been for many years (Bigos 2009; Steffens 2016; Shahvarpour 2017; Hartvigsen 2019). Recent studies have identified mechanisms (i.e., 'cross-talk') between running and strengthening of the intervertebral disc (Belavy 2017; Espinosza Oriass 2020; Vadala 2023). However, physical activity and exercise have many benefits and a mitigating role beyond musculoskeletal disorders (Booth FW 2000, 2002; Sun Q 2010; Basso JC 2016/2017; Santos-Parker JR 2018; Choi KW 2019). We conceptualized the negative cycle fueled by activity and exercise avoidance many years ago (illustrated to the right - Rath 1992) – the intent was to focus treatment strategies to break out from this pattern when present and preventing it when not. This not only prevents unnecessary impairment and disability due to back pain but helps to prevent other chronic diseases associated with inactivity. At a worker's compensation conference in Upstate New York (Rath 2003) we stressed that if we really cared about our patients, we would do everything possible to avoid disability and keep them active while recovering.



Definitions and Basic DRS Concepts

The following are the definitions and description of basic terms and concepts I will use throughout the workshop. There will be additional definitions provided during special sections of the workshop.

Primary prevention – actions and behaviors taken to improve or maintain people's health and function (well-being) prior to onset of a disease, illness or to mitigate risks for injury.

Secondary prevention – actions and behaviors taken in early stages of a disease, illness or injury that facilitate complete recovery, and mitigate risks for recurrence.

Tertiary prevention – actions and behaviors taken after a disease, illness or injury is fully established to minimize consequences and mitigate risks for disability.

Quaternary prevention – methods to mitigate or avoid results of unnecessary, ineffective, and/or excessive interventions in the health system.

Iatrogenesis – the inadvertent adverse effect or complication resulting from treatment and/or advice of a healthcare practitioner(s). Regarding ARSD this includes a health-related disorder, disease, impairment or disability generated or exacerbated as a result of the treatment, advice and/or model utilized in providing care to the patient.

Activity-related Spinal Disorders (ARSD) – mechanical back and neck pain disorders related in onset to lifestyle, ADL and/or accidents; excludes medical, systemic and other non-mechanical causes (e.g., systemic inflammatory disease, infections, congenital anomalies, metastatic disease etc.)

Assessment - the subjective, objective, and functional processes utilized to identify the patient's symptoms and signs, develop the musculoskeletal diagnosis or classification that guides intervention strategy and selection of treatment tools, and measures the response to determine effectiveness.

Symptoms – the expression of what the individual feels or perceives because of their condition, disease, or disorder – this is often described as pain. We frequently use the concept, 'the symptoms or pain' to ensure that the individual is referring to any effect of an assessment, treatment, procedure, exercise, or activity upon the symptoms for which they have sought help.

Signs – a physical, observable, objectively measurable manifestation of the individual's condition, disease, or disorder.

Directly relevant sign – an examination or functional sign that reproduces or reduces the symptoms associated with a patient's MSD, i.e., directly affects their symptoms.

Indirectly relevant sign - examination or functional sign that does not reproduce the patient's symptoms, but adversely affects ability to control their symptoms and restore normal activity levels and function.

Centralization - this is when the most peripheral relevant symptom is abolished, and more proximal symptoms are produced and/or remain. Classic centralization with spinal disorders is associated with symptoms moving directly to or across the midline of the spine.

Centralization phenomenon - centralization of the symptoms accompanied by a reduction or elimination of the directly relevant signs that remains better afterwards with or without specific biomechanical control.

Directional preference - there is a specific, consistent direction or combination of movements that control relevant symptoms and signs. When unambiguous there is good correlation between the behavior of symptoms and signs in the history, upon searching for TTFB®, and direct assessment of corresponding activities.

Patient education – instruction and training given to the patient during clinical management of their musculoskeletal disorder; includes the theoretical basis for shared decision making and self-efficacy.

Manual therapy – 'hands-on' procedures used to restore motion, function and/or relieve pain.

Therapeutic exercise – exercise and activity used to achieve a specific clinical goal relevant to control of signs, symptoms and/or the restoration of physical function, i.e., safe, and acceptable activity tolerance.

Biomedical model – a disease, pathology-based model that emphasizes the importance of establishing a specific (medical) diagnosis that is required to identify a specific treatment and cure.

BioPsychoSocial model – a healthcare model based upon identifying and addressing the combined effects of biologic, psychological and social factors affecting human function in the context of disease, illness, or injury.

Musculoskeletal self-efficacy – an individual's belief, ability, and confidence to control their musculoskeletal health and physical performance capability when confronted with a musculoskeletal problem(s).

Common factors theory – theory of generic factors that contribute to outcome variance in patient treatment; developed in psychotherapy but applies to treatment of ARMSDs.

Duffy-Rath System© (DRS) 5 Core Prevention Elements – 1) Good biomechanical habits, 2) Effective management of fatigue and warning signals, 3) Healthy (adequate) ROM, 4) Strategic strength and conditioning, and 5) Positive attitude for musculoskeletal self-efficacy.

Tools To Fight Back® (TTFB®) – physical actions and behaviors that facilitate musculoskeletal health and function. In treatment these tools consistently control signs and/or symptoms and facilitate recovery of function; in prevention these tools facilitate successful application of the 5 core elements.

Opposite Movement Rule© (OMR) – the concept of using movements, activities, and physical procedures that reverse and balance the biomechanical and physiological use patterns for strategic micro-pausing and the prevention of MSD.

Self-determination Theory (SDT) - .an empirical theory in psychology related to those intrinsic and extrinsic factors and influences of human behavior that are self-motivated and self-determined.

Disability – legal designation of impairment in ability to function. This does not necessarily correlate to the degree of impairment, or intensity of pain.

Impairment – the observable, measurable (objective) loss of ability to function. This is not synonymous with, nor does it necessarily result in disability.

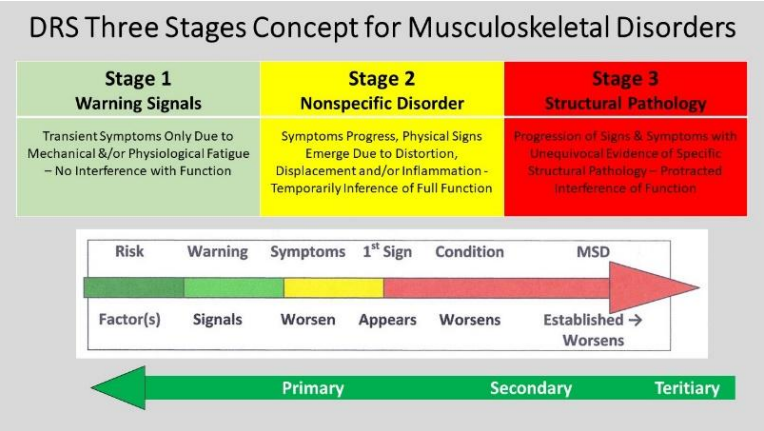
External evidence - the results of clinical research in professional literature that indicate reliability, validity, efficacy of assessment, treatment, and/or prevention with interventions for activity-related MSD.

Internal evidence – the results of an objective measurement of the response of each patient you treat in your clinical setting, or client you have worked with in an MSD prevention program.

Research-informed approach – the use of research findings that have the greatest likelihood of improving the effectiveness and efficiency of interventions with specific populations of activity-related MSD. The use of this term rather than 'evidence-based' approach, innately recognizes the limited applicability of research findings to a specific individual. Despite the strength of the research, the response of the individual patient to the treatment or prevention approach supersedes.

The DRS Three Stages Concept

This is a concept we developed at the start of the DRS when working onsite at Ethicon, Inc. in 1984. The workers coming to us for treatment who did not have an accidental onset to their problem all described warning signals before their condition became bad enough to seek treatment. Since our treatment approach was ultimately focused on the prevention of recurrence of the same disorder, we needed to provide the patients with the awareness and skills to recognize and manage warning signals that a problem was trying to return – this then became the basis for the prevention programs we ultimately developed.



Most of the patients who came for treatment were rapidly reversible, falling into the second stage – generally known as nonspecific, activity-related disorders. Then there was a small group with unequivocal signs, symptoms, and diagnostic evidence of structural pathology, e.g., ruptured disc, relevant spinal stenosis etc. Many of these could be reversed, but slowly and gradually. Some could improve to a certain level shy of normal, and this is the group where a referral to the spine surgeon might be warranted. In all cases, at all stages, the importance of activity and exercise is a theme of the interaction and encouragement is always provided.

Assessing the Effect of Physical Tests, Procedures, and Activities

The terms to the right need to be used with discipline in establishing the proper DRS conclusion group and initial treatment strategy. To do this you need to know the status prior, what occurs during the application, and then the result afterwards. We provided operative definitions for the McKenzie Institute and published this in their Newsletter in 1993.

Standardizing Symptom/Sign Assessment Terminology

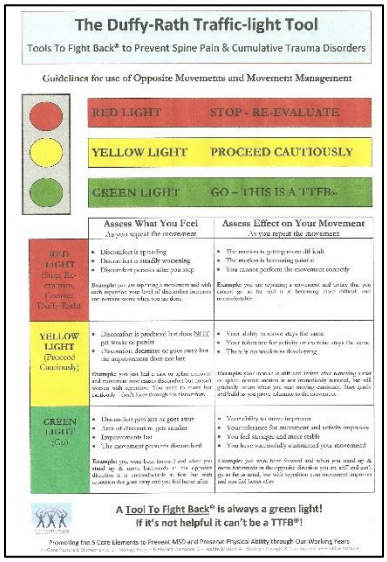
3 stages to the assessment: status before, during and after

Term (Abbreviation)	Status Before	Status During	Status After
Produces (P)	No Symptoms/Signs	Created	TBD
Increases (I or ↑)	Symptoms/Signs Present	Enhanced	TBD
Decreases (D or ↓)	Symptoms/Signs Present	Diminished	TBD
Abolishes (A)	Symptoms/Signs Present	Eliminated	TBD
No Effect (NE)	Present or Not Present	No Change	TBD
Worse (W)	Present or Not Present	Variable	More symptoms and/or signs
No Worse (NW)	Present or Not Present	Produced/Increased	No different
Better (B)	Present or Not Present	Variable	Less symptoms and/or signs
No Better (NB)	Present or Not Present	Decreased/Abolished	No different

Paradoxical Symptom Response – movements, postures, activities, procedures that initially lessen or abolish the symptoms with repetition or time make the condition worse and/or initially produce or increase the symptoms but then make the condition better.

DRS Traffic Light Tool

Patients are often apprehensive to exercise, reactivate, or have physical procedures performed on them when they have pain. And clinicians are also prone to being apprehensive about doing things to patients that might make them worse. Jean and I recognized this and developed an assessment tool to help everyone know when to continue or not. This is known as the DRS Traffic Light Tool and is used extensively.

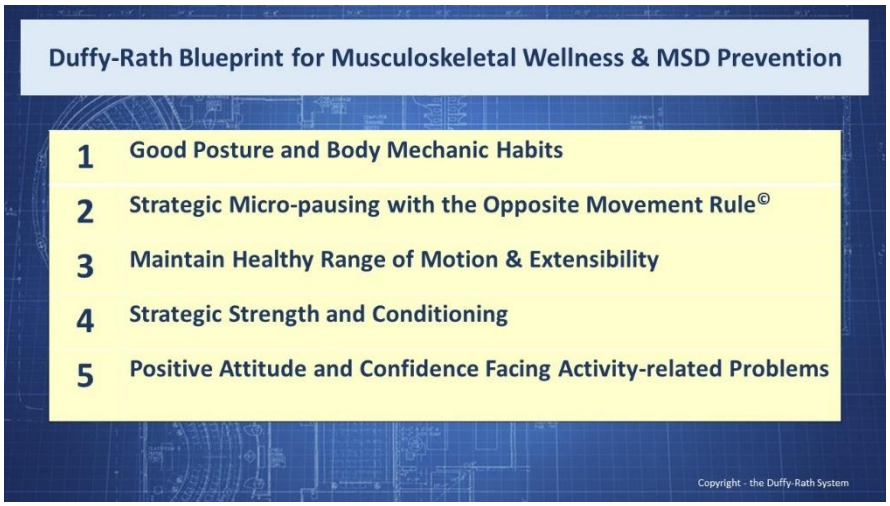


In our experience too many people stop when there's a 'yellow light' – that reinforces fear avoidance behaviors that are usually unproductive. And with further exploration of a repeated movement, a sustained position, a manual procedure, or an activity or exercise these lights might turn green (i.e., the paradoxical pain response we identified and defined). We use this tool every day for education and training.

DRS MSD Prevention Blueprint

This is the foundation for our approach for musculoskeletal wellness and MSD prevention. These are the habits, actions, behaviors, and beliefs we have found common to people who are able to remain physically active and able lifelong. Integration of this is especially important when an

individual is faced with a musculoskeletal disorder, accidental injury, and/or post-surgery. It is our mission to find the best way for individuals to implement this specific to their needs and predilections.



Section Two

Physical therapy plays a major role in the conservative treatment of activity-related LBP disorders. Although in most cases a structural diagnosis cannot be reliably established, we need to isolate the most relevant activity-associated causes (i.e., 'triggers') of the patient's symptoms as well as that which exacerbates the symptoms once triggered (i.e., 'aggravating factors'). In addition, we need to identify the most relevant physical and functional signs of the individual's problem, distinguishing that which is directly and indirectly relevant to the symptoms and activity interference. Once we do this, we can make an educated guess as to the source(s) of the symptoms. However, even if we are not correct, if we control the symptoms, eliminate the signs, and restore full function it doesn't matter. And, if we educate and train the individual to recognize and respond to warnings of recurrence or progressions of the problem, we are now prevention-focused.

In stage 3 disorders an unequivocal structural diagnosis can be established. Physical examination findings, symptom location and behavior, impact on function, and diagnostic findings all correlate well. In this group, the question is, can physical therapy alone provide a solution or is a multi-disciplinary approach essential to recovery? This is where a good working relationship with the spine surgeons and other specialists is critical.

Before we get into the clinical assessment process, we should bear in mind that most people who experience a back pain episode annually do not seek healthcare with a licensed practitioner. The natural history of a low back problem is very favorable, but recurrence is a major concern. It has been known for many decades that the most reliable predictor of a work-related LBP problem is the history of having reported one previously (Bigos 1992). Guzman et. Al. (2008) presented a

new conceptual model for neck pain disorders where it was stated that; neck pain can be perceived as a lifelong experience of recurring episode with varying degrees of recovery in between. This is no different for low back problems, as well as most of the activity-related MSD in other regions of the body.

Last, although our initial interventions onsite in industry began in the mid 1980's the Duffy-Rath System© for musculoskeletal wellness and MSD prevention was honed onsite at Carrier Corporation in Syracuse, NY by Jean in the 1990's. We had already been providing onsite treatment and she presented to site management the fact that 50% of the workers sent to us for treatment really did not need physical treatment. What they needed was education and training to manage warning signals of a potential injury at their worksite. She was then asked if that meant she could reduce OSHA injury reports by 50% - Jean took a deep breath and said yes. In the first year, OSHA injury reports were reduced by 80%.

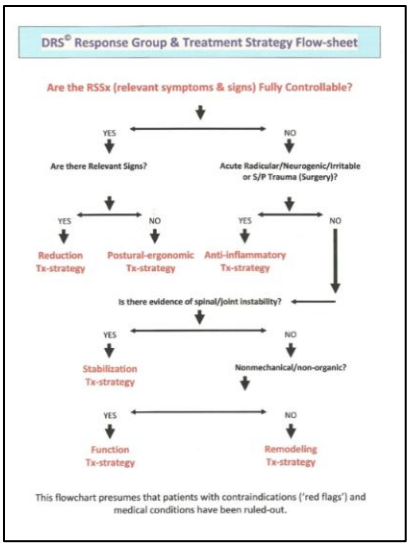
Our system won an award of excellence from UTC/Carrier Inc. The medical director (Joseph Monkofsky, MD) had it reviewed by a leading OSHA expert who found it to be the most innovative MSD prevention program he had seen in the country. This was the start of the expansion and evolution of our prevention services that continues to this day.

The Clinical Assessment Process

For the purposes of this workshop, it is presumed that contraindications to physical therapy treatment have been ruled-out. That is an obviously important component of the clinical assessment process and can be reviewed in our textbook (Rath 2014) and many other resources.

In our system of treatment and prevention there are 4 different response groups and 6 possible treatment strategies. Determination of the response group is the product of the initial and subsequent assessment processes. The response group, along with the presence or absence of certain findings determines the treatment/intervention strategy. Treatment visits or prevention sessions after the initial one determines if the conclusions were accurate, if the intervention strategy is working as expected or needs progressions or does the conclusion and/or strategy need to change. The following table and flowsheet identify the process of determining where to initiate and/or progress the treatment.

Response Groups	**DRS Treatment Strategies**	
Rapid	Postural-ergonomic	Reduction
Cumulative	Remodeling	Stabilization
Adverse	Biomechanical Anti-inflammatory	
Non-mechanical	Function	



The History-taking Process

It all starts by obtaining an accurate and effective history of the problem or concern; we are strong advocates for the use of a compassionate, open-minded, but structured interview process. In this initial interaction with the patient or client the therapeutic bond is initiated as well as the education and training for both parties. James Cyriax, MD always advocated that the patient would identify the source and solution to their problem if we ask the right questions and listen to what they have to say.

I want to focus on 4-key questions in the history process. These are: 1) onset of the current problem, 2) symptom location, 3) symptom frequency, and 4) symptom and sign behavior.

1. Onset Information - this first question has 2 components: first establish when this episode started (i.e., date of onset), and then how it started (mechanism of onset).

1.1 Date of onset: It is best to establish the onset date for the current ARSD first. On our assessment form you find a section to record either the actual date (month/day/year) or an estimated date (+/-, record month and year) when the patient cannot identify an actual one. I have found that more patients provide estimated dates.

When patients are having difficulty estimating when the current ARSD started, ask them to identify the last time they felt and functioned normally regarding their back problem, i.e., no symptoms and no interference with their normal activities for a week or longer. The month and year are then recorded as the estimated onset date.

Some patients have frequently repeated acute disorders, i.e., they are completely normal in between episodes. Some have not returned to normal for an extended period of time but have episodic exacerbations. The clinical expectations for these two groups of patients are different, but they are easily confused as the same when the history-taking process is sloppy.

Based upon the Quebec Task Force Report (Spitzer et. al. 1987), we categorize the duration of the episode as: **Acute** – less than 7 days; **Subacute** - one to seven weeks; **Early chronic** – 7 – 26 weeks; **Late chronic** - > 26 weeks.

1.2 Mechanism of Onset: How did this episode start? Once the onset date is established ask the patient; "how did the episode start, i.e., was there one incident or event you can identify that caused the symptoms to commence?"

NIE – there is no one incident or event.

Incident-A – this is an incident related to a normal activity of daily living (ADL).

Incident-B – this is an unguarded, unexpected, sudden biomechanical component of force that occurred with a normal ADL (e.g., slipped but did not fall).

Trauma – there was a high velocity, high magnitude accident ± impact (e.g., motor vehicle accident, fall, struck by an object etc.).

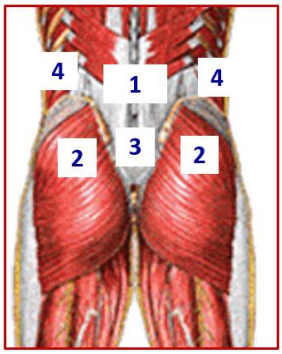
Once the mechanism has been established, identify any relevant biomechanical and physiological factors associated with the onset when possible. When there was no incident or event, ask the patient what they think might have been relevant factors, or if there were any unusual physical activities performed in the immediate days before the symptoms developed?

Results of a mechanism of onset study we did at one of our industrial clinics.					
Category	**NIE**	**Incident - A**	**Incident - B**	**Trauma**	**Total**
Overall	***690***	***345***	***128***	***158***	***1321***
Population %	*52.2*	*26.1*	*9.7*	*12.0*	*100*
Work-related	**462**	**295**	**109**	**103**	**969**
Group %	47.7	30.4	11.2	10.7	*100*
Not Work-related	**228**	**50**	**19**	**55**	**352**
Group %	64.8	14.2	5.4	15.6	*100*
Low Back	165	144	18	17	*344*
Group %	48.0	41.9	5.2	4.9	*100*

Patients with NIE and incident-A onset fall into the cumulative musculoskeletal disorder group, indicating biomechanical and physiological habits are at the root cause. These are the problems that all go through stage one. Ones vulnerability to an incident-B onset is influenced by their pre-incident physical strength, conditioning and musculoskeletal resilience which is strongly influenced by exercise and activity habits. Trauma is clearly an accident, consequently a safety issue for prevention with treatment guided by known stages of healing and the specifics of the injury. These two onset mechanisms start in stage two or three depending upon the severity of the signs and symptoms.

2. Symptom Location - symptoms are a report by the patient of what they feel, and the location is where they feel it. The symptoms may be in one isolated spot only (i.e., local), radiating in a non-specific pattern (i.e., somatic referred) or radicular (narrow band in the limb of severe intensity following a nerve root distribution, accompanied by nerve root signs) – see table below. Multiple sites or locations of symptoms can be due to one regional source, or multiple sources presenting simultaneously.

Each area of symptoms needs to be isolated and then investigated individually to determine if there are multiple sources. Once I identify the possibly of multiple problems presenting simultaneously, I number the different locations (e.g., #1 = across lumbar spine, # 2 = lateral buttock, # 3= P-L thigh and calf etc.) to see if they have the same or differing frequencies and behavior.



1-Lumbar 2-Buttock
3-Sacral 4-Loin

Establishing the current location of symptoms (within the past 1-2 weeks) is most important. However, the location at onset provides insight into forces/loading patterns associated with onset (e.g., central symptoms are sagittal, unilateral involve rotation and/or lateral flexion

in one direction etc.). When the problems are late stage subacute or chronic, check to see if they at any time differed from onset or current.

Frequency of symptom location in our first consecutive case series investigation; n-319 (Rath 2014)			
QTF 1 Local Pain	**QTF 2** Local + prox. referred	**QTF 3** Local + distal referred	**QTF 4** + Radicular
122 (38.3 %)	58 (18.2 %)	85 (26.6 %)	54 (16.9 %)

3. Symptom Frequency - symptom frequency is a measure of severity and behavior. When symptoms are the product of a nociceptive stimulus, the cause is mechanical (i.e., deformation, distortion of innervated tissue), chemical (i.e., inflammation or aggregation of noxious agents), or thermal (not applicable to our discussion). When the nociceptive stimulus increases the symptoms become more frequent to the point where they are continuous (i.e., larger concentrations of chemicals or constant mechanical distortion or distention). However, the perception of pain does not require a nociceptive stimulus, and this is frequently the case with chronic pain, especially chronic widespread pain, or neuropathic pain (central or peripheral).

3.1 Constant symptoms: the symptoms are continuous and never 'shut-off' or feel completely normal (i.e., never rated as 0). These symptoms are labeled '**mechanical constant'** when the intensity of these symptoms increases or decreases with activities, movements, and positions. These symptoms are labeled **'non-mechanical constant'** when the intensity of these symptoms does not alter in response to activities, movements, or positions.

3.2 Intermittent: the symptoms are intermittent when they at least temporarily stop, 'turn-off', drop to 0 or feel normal for time periods during the day. These symptoms are labeled **'stable intermittent'** when they quickly or immediately cease when the patient stops doing whatever it is that triggered them and there is no activity-related consequence as a result. The symptoms are labeled **'unstable intermittent'** when the patient stops the triggering activity and the symptoms persist, have consequences and/or progressively increase with additional exposure.

Non-mechanical constant pain is very concerning and requires careful clinical attention as this is characteristic of a medical and possibly sinister condition – this requires further work-up and you should confer with the patient's medical physician.

Mechanical constant and unstable intermittent pain require a conservative and careful approach to both examination and treatment so that the patient's condition is not irritated. Stable intermittent symptoms require a thorough mechanical assessment.

Remember that you need to determine the frequency for each of the symptom location patterns identified with key question 2 when there is more than one.

4. Symptom Behavior (Current) - this is a critical and unique section of the history-taking. This line of questioning addresses the presence or absence of mechanical patterns of symptom behavior, identifies what ADL are interfered with by the disorder, provides insight into the

patient's objectivity, shows your determination to get to root causes of the problem and is frequently very educational. Explain the process to the patient before you begin.

Standardized terms used to describe symptoms response to assessment procedures.	
Term	**Definition**
Better	The activity/position reduces or abolishes symptoms that were present.
Worse	The activity/position produces symptoms that were not present or increases those that were present.
Varies	The effect upon the symptoms varies. Have the patient explain this and/or ask more questions to learn more. This is a common and very important response as you and the patient will learn a great deal of relevant information.
No Effect (NE)	If symptoms are present the activity/position will not increase or decrease them. If symptoms are not present, the activity/position does not produce any effect.
Doesn't Know/ Not Sure (???)	Haven't performed the activity/position recently, have not paid attention or am not sure.

Four groups of questions regarding the behavior of symptoms and signs:

- **The effect of specific ADL on the symptoms** – this is the bulk of the questioning; adjust the questions to activities, movement, and positions relevant to the region of the musculoskeletal disorder. Be certain to note what symptoms are affected, in what sequence (when applicable) and anything that is biomechanically specific to the response of the symptoms.

- **Effect of time of day** – this is a more general line of questioning, looking to see if the symptoms are their best or worst at certain time periods, or are they a product of specific activities/positions regardless of daytime.

- **Val Salva's/deep breath** – this is most relevant to spinal disorders; pain upon coughing, sneezing, or straining is not pathognomonic, but highly associated with discal pathology. Pain and difficulty taking a deep breath with thoracic spinal pain is strongly associated with a relevant loss of segmental thoracic extension.

- **Other** – always give the patient an opportunity to provide more information that your structured process and approach may not have uncovered.

There is more information to obtain other than the answers to these 4-key questions. However, for this workshop I want to focus on how the differing patterns of presentation to these questions affect our conclusions, selection of treatment strategies, expectations, and how we might craft the intervention into an activity, prevention, long-term focused approach.

Start Low Back Screening of Your Lab Partners

Our workshop today involves practicing manual and therapeutic procedures - since most everyone has had an LBP episode at some point in their life, we need to screen each other to make sure you don't practice inappropriate procedures with your lab partners. So, identify who your partner(s) are going to be and let's start going through a screening process:

1. Has your partner(s) ever had a previous LBP problem?
2. If yes, did they recover 100% (symptom free and function full)?
3. Are you currently having any back pain, problems, or issues?

If no to # 2 and/or yes to # 3 you need to be careful about what procedures, you practice with this partner during the lab sessions; get help from the instructor whenever needed and <u>always</u> ask your partner if it is OK to proceed? ***Partners it is OK to say no!***

The Basic Low Back Examination

The physical examination identifies the relevant signs of the individual's back problem, both directly and indirectly relevant to the symptoms and current functional status. We intentionally keep it as simple as possible yet provide enough information to classify their condition and choose the best initial intervention strategy. The following is an outline of the entire process, noting that many of the steps are only if needed.

Outline of the DRS Basic Low Back Examination
1. Observation/Inspection
1.1 Posture and Body Mechanics
1.2 Visual Inspection: deformity, asymmetry, anomaly, atrophy, disease etc.
1.3 Visual Observation: pattern of movement, non-verbal communication etc.
2. Neurologic Screening (PRN)
2.1 Reflexes (DTR & Cord)
2.2 MMT (motor)
2.3 Sensory
3. Motion Assessment (active and passive)
3.1 Intra-articular
3.2 Extra-articular
3.3 Qualifying tests (e.g. spring testing, CPT etc.)
4. Contraction Testing (PRN)
4.1 Symptom Reproduction Testing
4.2 Strength & Stability Testing
5. Palpation (PRN)
6. Auxiliary/Orthopaedic Special Tests (PRN)

Postural & Biomechanical Assessment

Observation of the patient or client starts immediately. We need to determine how posture and movement habits influence the onset and perpetuation of their problem, the presence or absence of acute lumbar deformity, the impact of their symptoms on their willingness to move etc.

In the clinic the patient is usually sitting while we take their history, so we obtain some information about sitting postural habits as well as those getting up and down from sitting. We

will have to dig further to understand their biomechanical habits relevant to ADL that is triggering or aggravating their symptoms later in the assessment and treatment process.

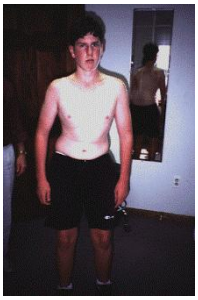
The industrial (prevention) client is likely to be standing or working while we obtain the history. We immediately obtain information about movement habits, work technique etc. but may not have the information about the influence of sitting and other ADL that is relevant. In either situation, what we need to identify in this section of the examination is the following:

1. What is the basic posture habit (static and dynamic) and is it relevant to the onset and perpetuation of their problem?
2. Is there evidence of acute lumbar deformity (i.e., kyphosis, lateral shift, accentuated lordosis)?
3. Is there structural asymmetry, anomaly, or abnormal findings and are they relevant?


Acute Lateral Shift


Acute Kyphosis


Acute ↑ Lordosis



Acute Kypho-scoliosis

When the unequivocal presence of an acute lumbar deformity is identified I usually get straight into a careful and meticulous treatment of the disorder – we will discuss this in greater detail later in the workshop. I am always cautious in the management of these patients, but especially if there are root compression or tension signs.

Motion Loss Assessment

This is the most consistently important component of the physical examination. There are three key questions to be answered: 1) is there any loss of the individual's normal ROM, 2) is the loss directly or indirectly relevant to the symptoms and functional interference, and 3) is the loss of motion inside and/or outside of the lumbar motion segments? The following are motion loss assessment procedures for the low back exam:

Simple Screen Standing:

1. Flexion standing
2. Extension standing
3. Lateral flexion right (combined side glide and side bend)
4. Lateral flexion left (combined side glide and side bend)

Lumbar segmental loss is rated on a scale of 0 – 10 (0=no loss, 10 = no movement), endrange limiting response noted (normal or symptomatic), any pain during movement noted. At this point you need to determine if you have enough information or are further clarifying procedures needed.

Clarifying Motion Loss Procedures Standing:

1. Flexion in step-standing
2. Extension in step-standing
3. Lateral flexion in step-standing

These procedures help you determine if the loss of motion and any effect on the symptoms is generated from inside or outside of the lumbar motion segments.

Additional Clarifying Motion Loss Procedures:

1. Spring testing (extension and/or flexion)
2. Quadruped flexion and/or extension
3. Supine flexion and/or SLR
4. Prone with FNS removed and/or added
5. Slump test
6. CPT in any of the relevant directions

Spring testing can be performed in extension (prone) or flexion (sitting or standing in forward bending). When positive, that usually indicates the segment below (i.e., positive L5 = L5-S1) is the likely source of those symptoms.

Further Lumbar Examination Needed

When the postural and motion loss assessment does not provide you with enough information to come to an initial conclusion and get a treatment or prevention strategy started, you need to go further with the examination. Provided the symptoms are in the lumbo-sacral region I would consider contraction testing and palpation to look for relevant reproduction of symptoms. This is more likely to be needed when there has been a recent type-B incident, trauma, or some unusual exercise or activity exposure. This could also be needed in the process of identifying chronic widespread pain, or other chronic musculoskeletal conditions.

Lumbar Examination is Unremarkable

When the relevant symptoms are not lumbar or sacral, rather in the buttock or groin ± referral you need to examine the sacroiliac and/or hip joints. These are not covered in this workshop as we are focused on common problems emanating from the lumbar spine. I favor Laslett's (1994;

2003; 2005) process for identifying sacroiliac joint disorders. I utilize Cyriax's (1975) hip examination process to determine the presence or absence of a hip joint or soft-tissue problem.

DRS Assessment Conclusions & Treatment Strategies

After completing your examination, you need to establish a conclusion that leads to the best choice of an initial treatment strategy. In our system there are 4 basic conclusions and 6 treatment strategies as mentioned earlier in the workshop. Let's explain each further:

DRS Conclusion	Clinical Reasoning
Rapid	A stage 1 or 2 disorder; symptoms are easily or consistently controllable and there is no loss of function or a quick return to full function should follow.
Cumulative	A stage 2 or 3 disorder; there is no clear directional preference, or it does not result in a rapid restoration of function – will take time to build tolerance and full control.
Adverse	S/P trauma in acute phase, there are root compression signs, condition is easily irritated, examination (± history) demonstrate current possibility of worsening. This is the most conservative starting point.
Non-mechanical	There is lack of consistent, correlating mechanical behavior of the symptoms and signs. These are typically early or late-stage chronic conditions, many have not responded to previous (good) care. Signs are often inconsistent with a disproportionate amount of symptoms and interference with function.

DRS Tx-Strategy	Description
P-ergonomic	Focused is to education and training in the first 2 elements of the 'DRS Prevention Blueprint' once cause-and-effect has been established. Ultimately to include how to employ the remaining 3 elements long-term.
Reduction	4-stages approach: 1) achieve reduction, 2) maintain reduction until stable, 3) recover full function, 4) prevent recurrence
Remodeling	Focused on a gradual and progressive restoration of tolerance to activity through strategic exercise customized to the functional and clinical needs of the individual.
Stabilization	Same focus as with 'remodeling', however this group has a directional bias that does not lead to rapid reversibility.
Biomechanical Anti-inflammatory	Focused on controlling triggers and aggravating factors through postural, movement and body mechanic instructions specific to reducing intensity, frequency of relevant symptoms and signs.
Function	Focused on a gradual and progressive restoration of activity through use of midrange biomechanical control, graded exercise exposure, training in non-mechanical pain mechanisms and management, maximal support, and encouragement.

Section Three

This section of the workshop addresses implementing a treatment strategy for five common LBP disorders with a long-term focus to prevent recurrence, while maintaining activity tolerances and physical abilities, i.e., linking treatment and prevention. The intent is to provide insights into the application of the different treatment strategies with differing, prevalent clinical presentations. The only strategy we do not cover is function, which applies to chronic pain, non-mechanical activity-related LBP disorders. This will be discussed at the end of the workshop but is too large a subject to cover effectively within the two days.

The five groups of disorders are:

1. Stage 1, early stage 2 low back pain problem. This requires a postural-ergonomic treatment strategy in our system which is the classic connection between treatment and prevention and the foundation of the prevention blueprint.

2. Lumbar derangement group that is responsive to a reduction strategy. In our experience this is the most prevalent conclusion seen in outpatient clinical practice. These can be responsive to extension, flexion, lateral or combination-based reduction strategies.

3. Lumbar nerve root adherence or entrapment as a complication to healing and repair post HNP or surgery – we did an extensive study of this which is available on our website for free download (Rath 1997).

4. Lumbar stenosis is a common problem seen in older patient populations, but we need to be certain that this can be confirmed with a physical and functional examination and not just a radiological finding.

5. Lumbar instability can be a product of a relevant spondylolisthesis or advanced internal disc disruption – we have the same radiologic concerns as with lumbar stenosis.

These 5 groups represent a good cross-section of LBP patients with differing treatment and prevention needs and considerations.

Low Back Disorder	Response Group	Tx-Strategy	Key Clinical Findings
Stage 1 – Beginning to Transition to Stage 2	Rapid	P-ergo	Stable intermittent – no directly relevant signs
Derangement – Reduction Responsive	Rapid	Reduction	Centralization phenomenon
Lumbar nerve root entrapment/adherence	Cumulative	Remodeling	Root/dural tension signs – acute phase over, not rapidly reversible

Lumbar spinal stenosis	Cumulative	Remodeling	Worse walking – better sitting, not a flexion-responsive derangement.
Lumbar instability	Cumulative	Stabilization	Worse endrange loading, especially in weight bearing – not rapidly reversible.

Stage 1 (Early Stage 2) Low Back Warning Signals

In outpatient clinical practice you are not likely to come to this as an initial conclusion unless you are catching the patient as their problem is almost resolved, or if you are working as a primary care provider. However, in our industrial prevention programs this is the most prevalent stage of a low back problem we encounter. In addition, when working with patients with more advanced stages of low back pain, most (if not all) will return to this stage over time, and they need to be aware and trained to manage the warning signals for long-term musculoskeletal self-efficacy. The treatment strategy to be used for this group is: **Postural-ergonomic strategy**.

The first step in this strategy is posture and body mechanic education and training (core element 1). This typically involves these 4 components:

1. **Sitting posture education and training** – I begin with education and training on how to find their midrange alignment in the sitting position. This helps them to understand the role of the pelvis in controlling movements and positioning of the lumbar spine, and the role of the chest in maintaining overall back alignment. In sitting you minimize the participation of the hip joints and the potential interference of inextensible multi-joint soft tissues posterior and anterior. This is often an 'eye-opener' for many people when you use anatomical illustrations, analogies such as the DRS Bent Wrist etc.

2. **Biomechanical control getting up and down from sitting** – this is the start to learning to use good body mechanics, especially for lifting and other manual material handling (MMH) tasks.

3. **Biomechanical control getting up and down from lying** – this adds to learning to use good body mechanics and will become especially important for maintaining reduction when managing a derangement syndrome (i.e., the next group we'll review).

4. **Biomechanical control performing specific tasks and functions** – ultimately this becomes the essential component of posture and body mechanic training and usually where the cause and effect needs to be established. During the history taking process you have identified what activities, times of the day etc. trigger or aggravate the relevant symptoms. You need to address each of these, prioritizing the triggers with specific instructions. In an industrial prevention program that is performed while the individual is working if the tasks performed are the triggers or aggravators. This isn't as available in the clinical setting.

The next step (core element two) is to introduce the concept of 'Strategic Micro-pausing' (SMP) with the 'Opposite Movement Rule©' (OMR). Many times, the first mechanical warning signal is stiffness or discomfort moving out of a sustained endrange position or series of repeated movements. Intentional movement in the opposite direction exposes and eliminates this and reinforces the need to improve postural and body mechanic habits, and the need to manage the various forms of fatigue proactively that can potentially accumulate into an MSD.

We developed the concept of strategic micro-pausing in the mid-1980s as a major TTFB® for prevention of recurrence and then modified it when given our first opportunity to implement a prevention program. We emphasized the importance of consistent and rapid response to warning signals with the following: 1) try to correct your posture, 2) if not fully effective, change your position and move, 3) if not fully effective, implement specific TTFB® procedures.

The most important thing to establish with the postural-ergonomic strategy is whether the specific instructions you have provided consistently control the warning signals. If they don't you have to figure-out why and make the appropriate adjustments, i.e., it can't be a TTFB® if it doesn't work!

Once the TTFB® is found, follow-through is adequate, you can address the remaining elements of the blueprint.

Responsive Low Back Derangement Syndrome

This is the most prevalent of the 5 groups in this workshop, and a major sub-group in the nonspecific spectrum of LBP patients. They present with local lumbar ± referred pain, are most likely to have had their symptoms for a short period of time (i.e., acute, or sub-acute duration) and are generally younger (Werneke 2008). Their history identifies a directional preference (e.g., better standing and walking; worse sitting and bending) and the examination identifies a relevant loss of motion that can be localized to the lumbar motion segments. The question then becomes; can this be reduced?

Evidence of reduction: relevant motion loss eliminated, symptoms centralized or abolished, and the patient remains better (i.e., in control of signs and symptoms) in a weight-bearing, functional environment with specific biomechanical control technique.

The term lumbar derangement was introduced by McKenzie; he started providing courses in the United States in the late 1970's and his groundbreaking textbook spelled-out his system of "Mechanical Diagnosis and Therapy" – this included 7 categories of lumbar derangements (McKenzie 1981). He had astutely synthesized information from preceding giants in orthopaedic manual therapies, including Cyriax, Kaltenborn, Stoddart, Mennell, and others. He was the first to develop a classification scheme that distinguished sub-groups of non-specific low back pain – equally important he subjected his system to research investigation. His "Perspective on Manipulative Therapy" renders the application of force to the spinal segments more logical, safer

and provides a connection to other procedures and behaviors needed for long-term efficacy (McKenzie 1989).

4 Phases of the Reduction Strategy

1. Reduce derangement and train patient to maintain.
2. Maintain reduction until symptoms and signs are stable.
3. Recover opposite movement if needed, reactivate back to all normal activities – includes strategic strength and conditioning if needed.
4. Complete training for prevention of recurrence – address all 5 core elements.

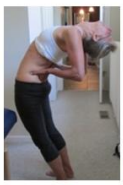
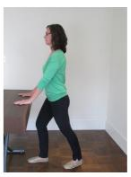
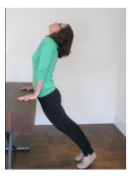
Candidates for <u>Extension Reduction</u> Procedures – Lumbar Spine

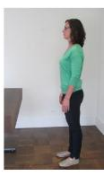
- **Onset:** no incident or event (NIE), with a normal ADL (incident-A). It is possible with an unguarded and unexpected incident where there was no clear trauma (incident-B) – but you may need to start with an anti–inflammatory strategy with this onset mechanism. Regarding duration of the symptoms, most likely to be acute, sub-acute or early stage chronic.
- **Symptom location:** lower lumbar spine ± referred; most likely to be central, symmetrical, or asymmetrical – can be unilateral with minor lateral signs and clear extension directional preference.
- **Symptom frequency:** stable or unstable intermittent with directional preference. Can be constant – but you may want to start anti-inflammatory before attempting reduction.
- **Symptom behavior:** better standing and walking (unless acute kyphotic deformity), worse sitting and bending – often difficulty extending from a sustained flexed position.
- **Motion loss** – segmental loss of lumbar extension with reproduction of 'the' symptoms ± motion loss in other directions

Reductive procedures for extension responsive derangement – these include lying in extension (prone or supine), press-ups, backbends (± traction), extension mobilization or manipulation, lumbar extension CPT (prone or standing) plus any repeatable end range extension procedures that achieves evidence for reduction. Let's practice these:

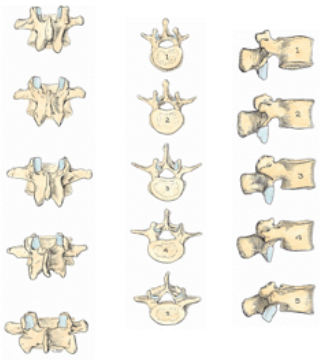
- Press-ups, extension standing – patient performance techniques.
- Extension combined performance techniques.
- Extension mobilization/manipulation.





Lumbar Extension Mobilization/Manipulation – the mobilization is a slow, rhythmical pressure on and off without losing contact – the thrust is small amplitude, high velocity force applied at end range.	
Component	*Description*
Patient Position	Prone, close to side of table & relaxed.
Therapist Position	Standing perpendicular to segment, chest over hands, feet comfortably spread for a good base of support – table at mid to lower thigh height (±).
Stabilization Contact	Not applicable – the position provides the stabilization for this technique
Mobilization Contact	Pisiforms against articular pillars (close to base of spinous process) at same level.
Line of Drive	P-A force parallel to superior end-plate of inferior segment (modify PRN).
Comfort	Relaxed hands, good contact (soft tissue tension removed) and patient relaxed.
Control	Start with grade 1. Progress to grade 2, and then to grade 3 (start gentle and increase if needed and as response allows) – manipulative thrust only after consent and favorable response to grade 3 mobilization (i.e. no adverse responses).
Assessment	Assess the symptom response during the procedure; the sign, symptom and function response afterwards. Has to have been a



P-A Mobilization Line of Drive

Lumbar Extension Combined Performance Technique Standing – this is a sustained extension mobilization (grade 2 ±) while the patient actively extends their lower back.	
Component	*Description*
Patient Position	Patient stands with anterior pelvis against treatment table (use pillow) in axial alignment.
Therapist Position	Therapist stands behind to one side of the patient with feet position in line of drive to maintain consistent pressure and move with patient.
Stabilization Contact	Position patient's pelvis against plinth with pillow (Gibb's technique), reinforce with hand, or use belt or arm around pelvis.
Mobilization Contact	Hyothenar contact behind spinous process.
Line of Drive	Mobilization hand applies anterior and superior force (modify according to response PRN).
Comfort	Relaxed hands, good contact (soft tissue tension removed) and patient relaxed.
Control	Mobilization component: start with grade 2, and progress to grade 3 as response dictates. Patient movement begins with mid-range and proceeds to end range as response allows.
Assessment	Symptom response during procedure, sign, symptom and function response afterwards.

Extension CPT Prone

Extension CPT Standing

"Dances with Joints"

The key to these techniques is to position you and the patient so that you can move synchronously while maintaining the same grade mobilization and line of drive from start to finish.

Phases 2 – 4: Once reduction is achieved the patient needs to be educated and trained to maintain it; this require reviewing and practicing how to maintain lordosis getting up from lying, sitting, getting to standing, basic ADL and other relevant activities the patient will perform prior to their next treatment session. The patient needs to understand the importance of frequently checking their extension (lying, standing, and sitting); if they have full and normal motion 1-2 repetitions is enough (i.e., they have maintained reduction). If symptoms and signs return, they need to go through the process of achieving reduction again and then figure why they re-deranged, i.e., they lost control of their lordosis.

I prefer to see these patients for consecutive days, at least two, to make certain they understand and are following through with my instructions properly and effectively. If this is not possible, I need a follow-up phone call and/or email. The successful reduction stabilizes their symptoms and signs within 3 – 5 days in most cases providing the aggravating factors have been adequately controlled. I encourage the patient to remain active during this time challenging their new posture and biomechanical habits – warn them of new 'muscle soreness' in their back and often legs, possibly arms from the press-ups.

Once they have maintained reduction you need to test the stability of the reduction. This starts with assessment of motion loss in standing; there are 3 general patterns of response at this point in the treatment:

1. Flexion standing was limited at the initial visit but has spontaneously improved even though the patient has been avoiding flexion. This proves that the initial loss of forward bending was pain inhibition that has diminished or eliminated by achieving reduction and avoiding the flexion-generated aggravating factors.

2. Flexion was not limited initially and is not limited now.
   a. If not painful now you need to determine if the reduction is stable by testing repeated flexion (start lying) and look for any early evidence of re-derangement.
   b. If flexion standing is now (or still) painful you need to determine why; possibilities include not fully reduced, over-reduced (i.e., there is a flexion responsive component) or there is another underlying mechanical problem. This needs further, careful reassessment.

3. Flexion standing was not initially limited but is now limited and painful. This requires reassessment. This is evidence of the need to start balancing extension and flexion; you need to determine if the derangement has switched directional preference.

4. Bear in mind that if the patient has rapid loss of the ability to forward bend standing, accompanied by new symptoms radiating into the leg and development of root tension signs the disc has prolapsed and the medical physician should be immediately notified, and the treatment strategy changed to anti-inflammatory. This is unlikely but does happen; the likelihood increases significantly when there is a loose fragment in the disc (Aspden 1999).

When the patient demonstrates no pain production, nor any adverse effect of their ability to extend with repeated flexion lying, sitting, and standing the reduction is now stable. The question now becomes ensuring that they get back to all their normal activities (work, home, and play) with commonsense and exploring the need to add strategic strength and conditioning (extension-based prophylaxis), i.e., core elements 4.

At the final visit make sure they know what they need to do to prevent and/or manage early signs of recurrence – encourage follow-up. I often orient the patient to the next 3 – 5 years as a critical time to establish new habits and behaviors and control their mechanical problem.

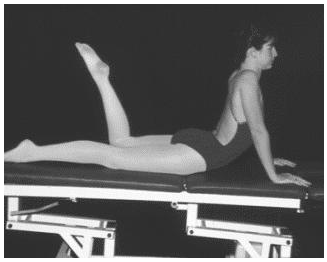
Candidates for Lateral Reduction Procedures – Lumbar Spine

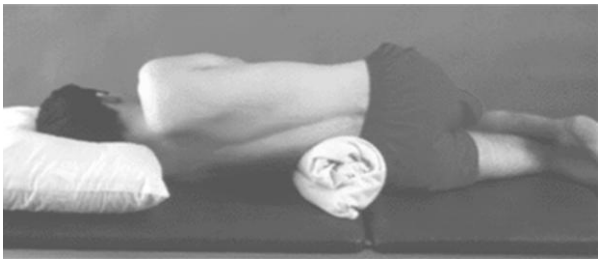
- **Onset:** no incident or event (NIE) and with a normal ADL (incident-A). It is possible with an unguarded and unexpected incident where there was no clear trauma (incident-B) – but you may need to start with an anti–inflammatory strategy with this onset mechanism. Regarding duration of the symptoms, most likely to be acute, sub-acute or early stage chronic.
- **Symptom location:** lower lumbar spine ± referred; most likely to be unilateral or asymmetrical – there is often an extension directional preference if the lateral signs are minor; this becomes less likely the larger the lateral component (e.g., an acute trunk list usually reports to be worse standing/walking)
- **Symptom frequency:** stable or unstable intermittent with directional preference. Can be constant – but you may want to start anti-inflammatory before attempting reduction.
- **Symptom behavior:** better standing and walking with minor lateral components; no better/no worse with moderate components and worse standing/walking with large lateral components; worse sitting and bending – often difficulty extending from a sustained flexed position.
- **Motion loss** – segmental loss of lumbar extension and lateral flexion (usually ipsilateral) with reproduction of 'the' symptoms. The degree of segmental loss indicates the size of the posterior and lateral component.

Reductive procedures for lateral/extension responsive derangement – these procedures essentially take two paths in attempt to achieve reduction: 1) the first path emphasizes extension procedures, but adds asymmetrical techniques to centralize the symptoms and eliminate the relevant loss of lateral flexion and extension – these typically have a small lateral component, or 2) the second path focuses on lateral procedures first to centralize symptoms and eliminate the loss of lateral flexion before focusing to extension reduction procedures – these are typically larger lateral components, epitomized by the acute trunk list. In both cases the restoration of segmental extension is ultimately essential for maintaining reduction.

The asymmetrical extension procedures include all the extension procedures previously identified but performed with the patient's hips off center (i.e., typically away from the side of pain) and/or with manual contact only on one side. The additional manual therapy procedures for this path include rotation techniques performed prone or side-lying. The lateral first approach is for derangements with a larger lateral component; this includes use of the lateral compartment

role procedure, various side-gliding techniques, rotation techniques performed supine and manual shift correction.



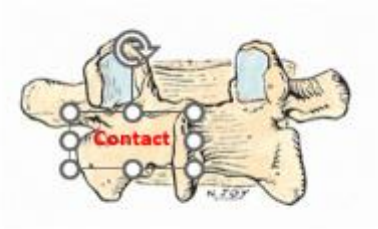


The following are key manual techniques that need to be mastered:

Lumbar Rotation Mobilization/Manipulation Prone – this is an asymmetrical extension technique with either alternating unilateral pressure or only unilateral pressure.	
Component	*Description*
Patient Position	Prone, close to side of table & relaxed.
Therapist Position	Stand perpendicular to segment, chest over hands.
Stabilization Contact	Not applicable – position provides stabilization.
Mobilization Contact	Pisiforms against articular pillar(s) (see picture below) at same level for alternating technique; or only on one side reinforced by other hand for unilateral technique.
Line of Drive	P-A force parallel to superior end-plate of inferior segment (modify according to response PRN).
Comfort	Relaxed hands, good contact (soft tissue tension removed) and patient relaxed.
Control	Start with grade 1. Progress to grade 2, and then to grade 3 (start gentle and increase if needed and as response allows) – manipulative thrust (unilateral technique) only after consent and favorable response to grade 3 mobilizations (i.e. no adverse responses).
Assessment	Symptom response during procedure, sign, symptom and function response afterwards.

Alternating Rotation Prone

Unilateral Rotation Prone

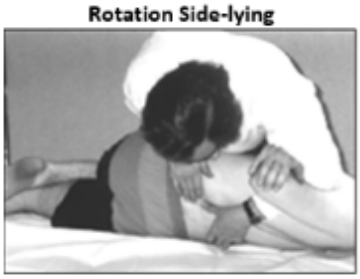


Lumbar Rotation Mobilization/Manipulation Side-lying ('grand roll') – this is an asymmetrical extension technique; most used as a manipulative technique.	
Component	*Description*
Patient Position	Patient lies on their side with spine in axial alignment. Top leg is flexed and adducted so that the segments below the target level are flexed and stabilized. Upper body is rotated to level just above the segment to be mobilized.
Therapist Position	Therapist stands perpendicular to patient and gets their chest over the segment to be mobilized,
Stabilization Contact	Cephalic elbow stabilizes the upper body against the side of the patient's chest ± shoulder and thumb stabilizes upper segment.
Mobilization Contact	Middle and/or index finger under spinous process of lower segment, while wrist and forearm against top of pelvis.

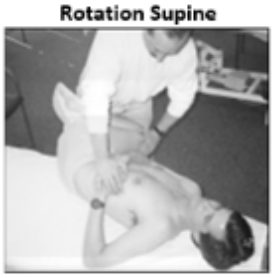
Line of Drive	Rotation of pelvis and segment in transverse plane parallel to superior end-plate of lower segment (modify according to response PRN).
Comfort	Relaxed hands, good contact (soft tissue tension removed) and patient relaxed.
Control	Start with grade 1. Progress to grade 2, and then to grade 3 (start gentle and increase if needed and as response allows) – manipulative thrust (unilateral technique) only after consent and favorable response to grade 3 mobilization (i.e. no adverse responses).
Assessment	Symptom response during procedure, sign, symptom and function response afterwards.

Lumbar Rotation Mobilization/Manipulation Supine – this is a pure lateral technique; most commonly used as a sustained mobilization procedure.	
Component	*Description*
Patient Position	Patient is supine with their knees bent and close to the edge of the table and pelvis lifted and turned (pre-set).
Therapist Position	Standing with erect posture at 45 deg. (+/-) angle to patient, close to axis of rotation.
Stabilization Contact	Caudal hip/thigh contacts anterior ankles/lower legs (maintaining longitudinal axis) and caudal hand stabilizes the thorax through patient's hands placed on lower ribs.
Mobilization Contact	Cephalic hand supports under the thighs at first and gently guides the legs downward until end range is achieved; then the hand can be placed on top of the knees to apply overpressure.
Line of Drive	Rotation around a longitudinal axis starting at 90 deg. hip flexion (modify according to response PRN) – this is a 'long lever' technique.
Comfort	Relaxed hands, good contact (soft tissue tension removed) and patient relaxed.
Control	Start with grade 1. Progress to grade 2, and then to grade 3 (start gentle and increase if needed and as response allows) – manipulative thrust (unilateral technique) only after consent and favorable response to grade 3 mobilization (i.e. no adverse responses).
Assessment	Symptom response during procedure, sign, symptom and function response afterwards.

Rotation Side-lying



Rotation Supine



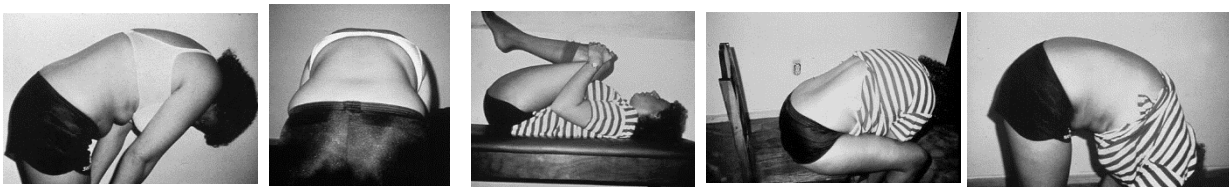
Candidates for <u>Flexion Reduction</u> Procedures – Lumbar Spine

- **Onset:** no incident or event (NIE) and with a normal ADL (incident-A). It is possible with an unguarded and unexpected incident where there was no clear trauma (incident-B) – but you may need to start with an anti–inflammatory strategy with this onset mechanism. Regarding duration of the symptoms, most likely to be acute, sub-acute or early stage chronic.
- **Symptom location:** lower lumbar spine ± referred; could be central, symmetrical, asymmetrical or unilateral.
- **Symptom frequency:** stable or unstable intermittent with directional preference. Can be constant – but you may want to start anti-inflammatory before attempting reduction.
- **Symptom behavior:** better sitting slouched or bending (i.e., flexion) and worse with standing/walking – this can be overlooked when the patient tells you they have pain and

difficulty with forward bending after certain activities – the painful obstruction to flexion is the result of having created the derangement with sustained or repeated extension.

- **Motion loss** – segmental loss of lumbar flexion ± lateral flexion.

Reductive procedures for flexion responsive derangement – this includes flexion lying, sitting, and standing, plus flexion CPT technique (sitting or standing). The presence of the derangement is easily exposed by having the patient sustain extension, and reduction is equally as simple – maintaining reduction is flexion based (i.e., avoiding end range extension until stable).



Combined Performance Lumbar Flexion - this is a sustained P-A mobilization (grade 2 ±) while the patient actively flexes their lower back.	
Component	*Description*
Patient Position	This can be performed sitting, long-sitting or standing.
Therapist Position	Stand to the side of the patient in line of drive; keep contact within base of support to provide effective stabilization while maintaining a consistent mobilization from start to finish.
Stabilization Contact	One hand/arm provides counter pressure on front of pelvis – or belt can be used for standing technique.
Mobilization Contact	Hypothenar contact against spinous process with mobilization hand.
Line of Drive	Sustained P-A force anterior and superior (modify according to response PRN).
Comfort	Relaxed hands, good contact (soft tissue tension removed) and patient relaxed.
Control	Mobilization component: start with grade 2, and progress to grade 3 as response dictates. Patient movement begins with mid-range and proceeds to end range as response allows.
Assessment	Symptom response during procedure, sign, symptom and function response afterwards.

Flexion CPT Standing

Flexion CPT Long-sitting

Flexion CPT Sitting

Clinical Management of Acute Lumbar Deformity (Kyphosis and Lateral Shift)

I separated out the management of acute lateral shift and kyphosis to emphasize the importance of meticulous management of these patients. And, if there are root tension and/or compression signs I strongly suggest that you begin with an anti-inflammatory strategy until their condition is not worsening, the tension and compression signs are improving or have been eliminated.

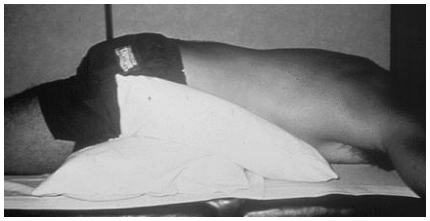
Acute lumbar kyphosis – this is a progression of the extension responsive derangement. It is best to see these patients as soon after the acute onset as possible provided it is not traumatic. If the patient is too acute to manage at first (i.e. twinges, severe difficulty with simple movements and you can't get the symptoms to settle) give them a few days to settle down before attempting again – ultimately their understanding of the problem, learning how to recognize and do something to arrest it earlier in its development is most important for their long-term health and ability.

Unable to Stand Erect

Major Loss Segmental Extension

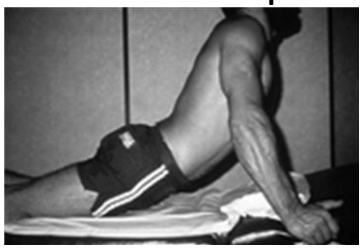
Can't Lie Prone

Initiate Sustained, Progressive Extension



Progress Sustained Extension

Initiate Press-ups



Stand-up Carefully – Check for Reduction

The first goal in the reductive process is to find a comfortable position lying prone; this requires accommodating the major loss of extension with pillows under the abdomen or adjusting the table into flexion. The second goal is to eliminate the kyphotic deformity, this is achieved when they can lie prone and stand straight without worsening. The next goal is to proceed as with any extension responsive derangement. Going slowly, sustaining the positions through the sequence and carefully getting to end range are keys to a successful reduction. Once the derangement is reduced, maintaining it can be tricky at first; the patient must keep their lordosis meticulously with all movement changes.

Acute lumbar lateral shift - reduction of the acute trunk list was McKenzie's original claim to fame (McKenzie 1972) – he called the acute deformity a 'lateral shift'. He was very proud of the fact that his manual shift correction procedure was only 'plate' in Cyriax's Vol. 2 textbook contributed by a clinician other than Cyriax – this placed him in the spotlight of the developing specialty of manual therapy. Laslett (2009) has published an excellent case report with video of an actual correction of an acute shift, plus maintenance and rehabilitation. An important observation by McKenzie was the recognition that with radiculopathy the procedure doesn't work, i.e. it is applicable for nonspecific disorders. In our system we state that you shouldn't attempt reduction with an acute deformity when the patient has a traumatic onset, or when there is radicular pain ± neurologic deficits.

This group of patients is the clearest example that you need to restore lateral flexion (i.e., correct the shift) before extension, and that reduction has not been achieved until they remain better in weight bearing. Maintaining lordosis after shift correction is a key because this engages the z-joints and stabilizes the segment with the posterior vertebral rims closed, preventing re-derangement. Porter (1986) did a study of the prevalence of this acute deformity, see table below:

Porter et. al. (1986) investigated the incidence and characteristics of gravity-induced trunk list* in 1,776 consecutive patients seen at a Back Clinic (eliminated were patients with short leg, structural scoliosis or a shift only with forward bending). This phenomenon was found to occur in a small group of patients, with 49 % related to advanced disc pathology.

Pop.	# G-I List	Gender		Symptoms			Side of List			Surgery	
	Study	M	F	Back	Bk + Thigh	Bk + B/K	L	R	Alt.	Surgery	No Surgery
1,776	100	62	38	16	13	71 *	66	31	3	20	80
Study %	*100 %*	*62%*	*32 %*	*16 %*	*13 %*	*71 %*	*66 %*	*31 %*	*3 %*	*20 %*	*80 %*
% Total	*5.6%*	*03.5 %*	*02.1 %*	*0.9 %*	*0.7 %*	*03.9 %*	*03.7 %*	*01.7 %*	*0.2 %*	*01.3 %*	*04.5 %*

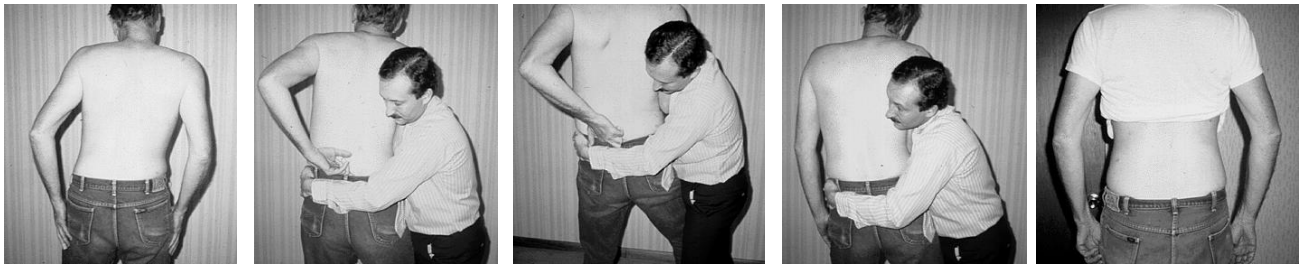
* 49/71 (62.0 %) met McCulloch's criteria for disc protrusion: 1) unilateral leg pain B/K in sciatic distribution, 2) specific neurologic symptoms identifying a nerve root, 3) limited SLR > 50 % normal, 4) ≥ 2 of the following: muscle wasting, muscle weakness, hyporeflexia, radiographic evidence of disc protrusion (Porter 1986).

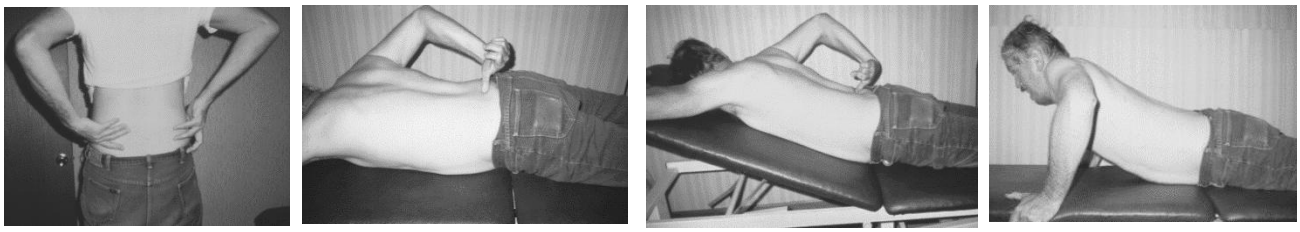
Sequence for Reduction of Acute Trunk List (remember: if too painful to tolerate, change to an anti-inflammatory approach for a few days utilizing the lateral compartment role procedure as a tool to gain control of the symptoms, then reassess):

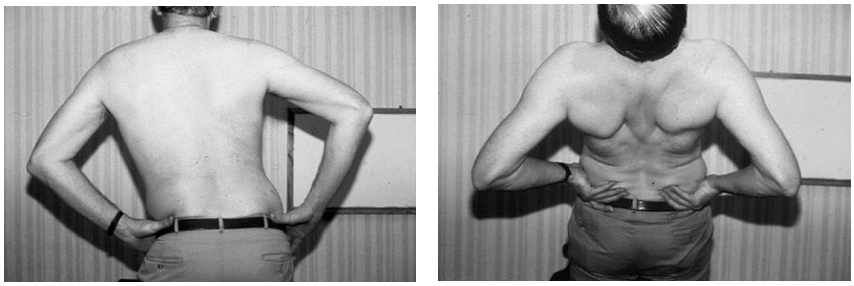
- **Restore lateral flexion:** if too acute to start this standing, then begin with the lateral compartment roll procedure – usually pain side down. In standing you can attempt manual correction of the shift with the patient flexed if there is a kyphotic component, this includes correction sitting. Ultimately the patient needs to demonstrate the ability to self-correct and side bend to end range without worsening – there are many techniques to achieve this (e.g., against wall, in door frame, one hand on ribs and the other on the hips etc.) Beware of the patient with an alternating shift; this small group requires lateral flexion procedures to be balanced and is tricky clinical situation.

- **Restore extension:** this should be attempted while maintaining the hips slightly offset to prevent the shift from returning; you do not want an end range slide glide for that locks the

z-joints and prevents extension. You can proceed to this after the lateral compartment roll procedure and after the restoring lateral flexion standing.







- **Maintaining correction (reduction) with basic ADL:** once the patient has restored lateral flexion and extension, they need to be trained to maintain their lordosis with hips slightly off center while sitting, getting up and down from sitting and lying, in and out of the car and with other basic and relevant ADL. While going through this with the patient you see how well they can follow through and how stable the reduction is – if not stable they are going to have to limit their activities more for a few days until they are more stable. Remember most of these acute (nonspecific) deformities spontaneously improve within one or two weeks.

These patients need to be seen and/or followed daily until under full control or the need for additional help is apparent. In our industrial clinics we would often see the workers with an acute shift 2 – 3 times during the workday but keep them working light duty while learning how to manage their problem. The patient with a successful outcome (expectation is 90% ± in the hands of a skilled therapist) never forgets the experience – an opportunity for a positive long-term impact.

Lumbar Trunk List Correction - this is a pure lateral technique used for correction of an acute (nonspecific) trunk list; also called "manual correction of acute lateral shift".	
Component	*Description*
Patient Position	Standing, feet spread for stable base, elbow bent and placed against ribs above iliac crest.
Therapist Position	Standing on side of list in line of drive, with feet spread and positioned to keep segments within base of support. You can be sitting when you do this (see Laslett video).
Stabilization Contact	Inherent in patient position standing with feet adequately spread, and provided there is a balanced push and pulling force applied (i.e. maintain even weight bearing).
Mobilization Contact	Shoulder against distal arm (head behind back) and both arms around iliac crest.
Line of Drive	Side glide by pushing upper body while simultaneously pulling pelvis towards (modify according to response PRN) – maintain even weight bearing; i.e. coronal force around a sagittal axis. It is important not to return all the way back to the starting position when pressure is released).
Comfort	Relaxed hands, good contact (soft tissue tension removed) and patient relaxed.
Control	Start with grade 1. Progress to grade 2, and then to grade 3 (start gentle and progress) as is appropriate – watch out for possibility of an alternating list and don't go fast as the patient can begin to feel faint from an autonomic response – monitor continuously.
Assessment	Symptom response during procedure, sign, symptom and function response afterwards.

Laslett article: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2700497/

Summary Lumbar Derangement Syndrome - this is a fun and exciting group of mechanical LBP disorders and can be a large segment of your caseload if you treat an acute, subacute population of patients. Although derangements are more prevalent in the young to middle-aged patients, you can certainly see them in the geriatric population too; just less likely.

When your clinical conclusion is correct, and you have chosen the corrective reductive strategy you expect > 90% to respond in ≤ 6 visits over a 2 to 3-week period. When a derangement syndrome fails to remain better, or stable enough to return to their normal activities within a 2 to 4-week time there is evidence for functional instability mounting and you probably need to transition to a stabilization treatment strategy (covered later in the workshop).

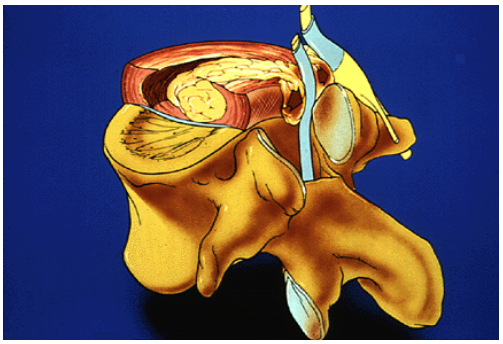
Also, don't forget that starting with an anti-inflammatory strategy for a couple days before pursing reduction can be a wise choice – especially when the patient is anxious, their symptoms

are easily provoked and/or you are not certain about your conclusions. We recommend taking an official McKenzie Institute course if you are not experienced or confident in how to identify and manage these clinical presentations – achieving a high-level of skill in treatment and preventing spinal and extremity 'derangement syndromes' has been a fun, exciting, and rewarding experience in our professional career.

Nerve Root Entrapment & Adherence

I suggest that you review our study results presented at the international McKenzie conference in 1997; you will see that this is a relatively small group of patients that can be challenging clinically, but many respond at least partially to a mechanical/activity-oriented approach (Rath 1997).

Adverse root/dural tension are the hallmark sign with lumbo-sacral radicular syndromes. HNP is the most common cause and the L5 and S1 roots are the most frequently affected. These two disorders are a sequalae that sometimes occurs as the patient's extruded, ruptured disc goes through the stages of healing and repair. In short, the difference between these two groups is that with entrapment the nerve root can move but is obstructed by the distorted P-L disc wall, whereas with the adherence the root sleeve or dura has become tethered to the repaired disc by scar tissue.



In the illustration to the left you can see how the prolapsed disc material can have a mechanical effect on nerve root mechanics; the descending root would be obstructed and if not moved could become bound to the back wall of the disc; the exiting nerve root would only be affected if bound (tethered). As tension build in the root with SLR it first moves parallel to the pedicle and then lateral

Common Clinical Characteristics: chronic disorder with history of radicular pain ± neurologic signs. There are persistent root tension signs; positive SLR for L5 and S1 roots, positive FNS for L3 and positive both for L4. There is no directional preference/centralization phenomenon, and the most acute aspects of their episode are behind them.

Differential Diagnosis: the first step to identify and distinguish these two disorders is to prove that the patient tolerates end range lumbar flexion. Since these patients have a history of non-contained lumbar derangement you need to be careful and conservative.

1. Start with flexion lying to isolate the test to the lumbar segments without simultaneously adding tension to the roots – test repeatability with 5 to 10 repetitions usually adequate. The patient should have no relevant loss of motion, nor any reproduction of 'the' symptoms.

2. Then have the patient turn over and test extension lying; remove root tension by flexing the hip and/or knee if needed – test repeatability with 5 to 10± repetitions. The patient should have no relevant loss of motion, nor any reproduction of 'the' symptoms.

3. Then test flexion in standing = lumbar flexion + root tension via sciatic nerve/sacral plexus. This is where the clinical distinction occurs when the L5 or S1 roots are involved:

a. **Entrapment** – there is initially a loss of motion with reproduction of pain, but with repetition the ROM significantly increases, and the symptom response diminishes. There is not a 'length-tension' response to end range loading, i.e., more overpressure at end range does not produce a consistent increase of symptoms, nor increased resistance (mechanical response) to stretching. The patient is no worse as a result and there is the illusion of better – this does not last.

b. **Adherence** – there is a clear loss of flexion standing, usually with a deviation towards the side of pain and always with a reproduction of 'the' symptoms. This does not substantially change and always demonstrates a consistent 'length-tension' response. The patient is no better and no worse as a result.

4. Then test extension standing and there should be no significant findings or change. However, if L4 or L3 roots are involved there may be a loss of extension with reproduction of symptoms until you repeat the test with the affected leg in step-standing = now there is no effect.

Clarifying tests – for the more common L5 or S1 root disorder, repeated SLR should elicit the same response described for flexion standing above. With L3 and L4 disorders repeated FNS ± extension lying should elicit the same pattern of response that distinguishes entrapment from adherence, but now with the use of procedures that apply tension through the structures anterior to the hip and knee.

L5, S1 (L4) roots - Sacral Plexus Through the Sciatic Nerve		**L3 (4) – Root Lumbar Plexus** Through the Femoral Nerve	
Add Tension	***Remove Tension***	***Add Tension***	***Remove Tension***
• Lumbar Flexion • Hip Flexion + Knee Extension • Ankle Dorsiflexion • Cervical Flexion	• Lumbar Extension • Hip Extension + Knee Flexion • Ankle Plantar flexion • Cervical Extension	• Hip Extension + Knee Flexion • Lumbar Extension • Cervical Flexion • Ankle Plantar flexion	• Hip Flexion (< 90 degrees) + Knee Extension (not full) • Mid-range lumbar & cervical extension and ankle dorsiflexion.

I strongly suggest that you begin the process gently and conservatively, e.g., 5 reps 1 – 2 x/day. Instruct and train the patient to start in a comfortable (asymptomatic) position, stretch only to the point where tension or discomfort begins, and then immediately return to the start position. Wait for the response to settle before repeating. I frequently use the expression; "Move to but not through the symptoms".

Treatment progressions should be slow and careful. Don't be in a hurry. Since these patients have a history of non-contained disc derangement, their program should include a focus on the prevention of recurrence for a posterior lumbar derangement, i.e., an extension-based program.

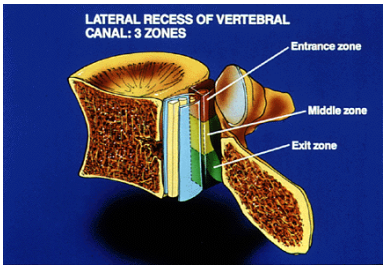
Comments on Preventing Adherence or Entrapment

Opportunities for prevention occur prior to and immediately after onset. Theoretically adherence should be easier to prevent than entrapment, i.e., with entrapment there are more variables that are not controllable including size and location of the extrusion, size and shape of the foramen, individual variability in root mobility and biologic responses etc. - whereas early neural mobilization should prevent adherence from developing. However, in both cases keeping the patient as active as possible from the start is an important prescription for recovery.

Lumbar Spinal Stenosis (Degenerative)

Clinical characteristics include age (invariably > 50 years), and always report a loss of walking/standing tolerance as their primary complaint. Without anchoring your clinical diagnosis by this essential fact many older patients with asymptomatic or irrelevant degenerative spondylosis are labeled to have stenosis – too many have surgery because poor, nonspecific conservative treatment didn't help, all influenced by the initial misdiagnosis.

This group of patients is clearly no worse with repeated or sustained end range flexion and no better with repeated or sustained end range extension. Their leg symptoms are clearly reproduced with walking, but this can be controlled if they walk with their lumbar spine fully flexed and unloaded (the 'shopping cart' sign).



Lateral stenosis gives rise to unilateral leg symptoms whereas central stenosis produces bilateral leg symptoms. These symptoms are produced with walking and are the result of circulatory congestion and resulting ischemia affecting the roots. Sitting slouched or bending over into flexion provides the patient with relief.

Remodeling treatment strategy for lumbar spinal stenosis:

1. Confirm the diagnosis with treadmill test and ensure there are no negative responses to sustained or repeated end range flexion.
2. Provide the patient with a clear explanation of their problem and how they are to gain control (fight back) against their problem. Train the patient to use lumbar flexion as their TTFB®; and then send them off to test these tools, observing for consistency of relief. The expectation is that it provides relief every time but does not alter the problem to any significant degree at first.
3. Train the patient to maintain lumbar flexion in standing and walking, i.e., posterior pelvic rotation. I usually include supine (± quadruped and side-lying) posterior pelvic rotation, but ultimately must be focused on standing/walking exercises. This includes strategic abdominal strength and conditioning with a flexion-bias. Don't worry about the sustained end range flexion if your diagnosis is correct; the discs are inactive with this group (this requires ongoing reassessment to confirm).

4. Address any indirectly relevant signs, including loss of extensibility of the hip flexors, hamstrings, hip joint flexion and/or lumbar flexion.
5. Progress steps 2 – 4 to tolerance and relevant to functional goals for treatment.

Flexion Side-lying

Segmental Flexion Mobilization Side-lying

- Rotate down to level above and then stabilize superior vertebra (X)
- Flex to level below and establish contact with inferior vertebra to mobilize (←)
- Mobilize by pushing knees up (→) into flexion and pulling inferior vertebra caudal and anterior (←) in flexion.

The other flexion mobilizations I tend to use with stenosis are the flexion combined performance techniques. These are used to provide symptom relief, increase segmental extensibility into flexion and possibly affect extensibility of hamstrings and neural tunnels (e.g., the long-sitting technique etc.).

Lumbar Spine Instability

There are two separate clinical presentations of spine instability we have recognized and managed with some degree of frequency. The first is the patient with no evidence of an HNP, the annular wall appears to be intact because there is directional preference to extension ± lateral but fails to remain better in a weight/load-bearing environment despite weeks of good care attempting to achieve stability of reduction. We refer to this group as having internal disc disruption. This group has local ± referred pain, but no root signs or symptoms. However, there may be dural tension, especially when the patient's problem is chronic. The corresponding DRS treatment strategy is stabilization with an extension-bias. This is a remodeling strategy with a focus on progressive and strategic strengthening (stabilization) exercise aimed at restoration of weight/load-bearing tolerance. The principles, education, and training for core elements one and two remain extremely important but must be modified for short and long-term control.

The second group is the patient with clinically relevant spondylolisthesis. They have the same problem as the internal disc disruption group, i.e., their problem is primarily with weight/load-bearing activities. The major difference is that this group exhibits a clear and reliable flexion-bias. This group of patients could be mistaken as a flexion-responsive derangement, but they are not rapidly reversible. In addition, they often do not get worse with extension procedures non-weight-bearing which is a major assessment tool for exposing a flexion-responsive derangement. The corresponding DRS treatment strategy is stabilization with a flexion-bias. There are the same goals as with the internal disc disruption, but flexion is now the TTFB®.

Section Four

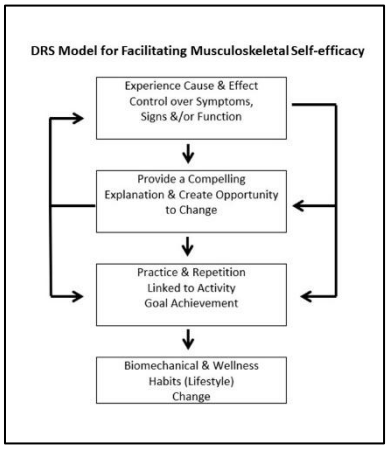
Now that we have covered the basic elements of our system, the low back assessment process, and four of the six treatment strategies I want you to divide into groups and come up with a clinical plan for a patient with lumbar instability, requiring a stabilization strategy. I want half of the groups to develop a plan for internal disc disruption at L5-S1, and the other for a clinically relevant grade 2 spondylolisthesis at L4 – 5. Each group should present the following:

1. The assessment findings that led to your conclusion and choice of treatment strategy.
2. Identify the most likely direct and indirectly relevant signs you would expect to find.
3. Identify the initial focus of your treatment strategy (i.e., the first 1 – 2 weeks).
4. Identify and demonstrate the initial stabilization exercises.
5. Identify how and why you would progress the stabilization exercises. Include the goal for completion of treatment. This is an opportunity to show-off some of your favorite exercises for this patient group.
6. Last, what are your long-term instructions to the patient.

This is intended to help you integrate the DRS concepts for life-long musculoskeletal self-efficacy into your treatment planning. We have much to learn from each other, and there are many differing ways to implement the core elements of our blueprint. I look forward to seeing what the groups come up with and learning some new things that I can take back to our prevention programs with me.

Workshop Summary:

This LBP conundrum is a big problem for a large swath of the adult population, and worsens through the aging process (i.e., the elephant in the room with all activity-related MSDs). Although it is never too late for people to begin trying to be healthier and commit to routine exercise and activity, it is best when started earlier in life. We probably have not talked enough about the fifth core element in our blueprint as it is often the 'game-changer'.



Attitudes and beliefs are predetermining, changing them can be difficult. Hopefully the plethora of multi-disciplinary evidence of the benefits of each of the elements of the blueprint will encourage more to achieve musculoskeletal self-efficacy. When working with individuals we rely upon a proven cause-and-effect in controlling the relevant symptoms and signs as the starting point. Followed by a compelling explanation as to how and why the tools worked and repetition until change occurs. This is an essential component of our 'Tools To Fight Back®' concept.

There are many ways to achieve this and no one profession or approach has all the answers. The DRS approach exposes our proclivities, biases, and is shaped by our experience. You may achieve the same or better results and impact by taking a completely different tact, but I would wager your approach has some or all the blueprint elements. Particularly if you are focusing toward an interactive experience for the patient's long-term wellbeing.

I did not address the chronic back pain patient with a non-mechanical presentation as I could not do justice to this important group in the two days. In our experience this can be a small segment of your patient population if you're in a primary care practice. Or it could be a more significant percentage if you're in a tertiary practice with many patients already disabled by their problem with or without medical-legal entanglements. This should be a separate course as your attitude, approach, and skills in managing difficult patients in difficult situations are challenged. Helping anyone in this group can be extremely rewarding.

Jean and I wish you well and hope that your exposure to DRS is helpful to you and your patients. Let us know if you have interest in learning more about our onsite musculoskeletal wellness and MSD prevention programs. Should a company in your area reach out to us for help we are likely to contact you as a potential prevention leader for our system.

References:

Aspden RM, Porter RW. Localized stresses in the intervertebral disc resulting from a loose fragment. Spine 24 (21): 2214-18, 1999.

Balci R, Aghazadeh F. Effects of exercise breaks on performance, muscular load, and perceived discomfort in data entry and cognitive tasks. Computers & Industrial Engineering 46 (2004) 399-411.

Basso JC, Suzuki WA. The effects of acute exercise on mood, cognition, neurophysiology, and neurochemical pathways: a review. Brain Plasticity 2016/2017: 2: 127-52.

Booth FW, Gordon SE, Carlson CJ, Hamilton MT. Waging war on modern chronic diseases: primary prevention through exercise biology. Journal Applied Physiology(2000) 88: 774-87.

Booth FW, Chakravarthy MV, Gordon SE, Spangenburg EE.Waging war on physical inactivity: using modern molecular ammunition against an ancient enemy. J Applied Physiology (2002) 93: 3 – 30.

Baumeister RF, Vohs KD, Tice DM. The strength model of self-control. Curr Directions in Psych Sci 16 (6): 351-55, 2007.

Belavy DL, Quittner MJ, Ridgers N, et. Al. Running exercise strengthens the intervertebral disc. Sci Rep 2017; 7:45975.

Bergouignan A, Legget KT, De Jong N, et. Al. Effect of frequent interruptions of prolonged sitting on self-perceived levels of energy, mood, food cravings and cognitive function. International Journal Behavioral Nutrition and Physical Activity (2016) 13: 113.

Bigos SJ, Battie MC, Fisher LD, et. Al. A longitudinal, prospective study of industrial back pain injury reporting. Clin Orth Relat Res 1992; 279: 21-34.

Bigos SJ, Holland J, Holland C, et. Al. High-quality controlled trials on preventing episodes of back problems: systematic literature review in working-age adults. Spine J 2009; 9(2): 147-68.

Choi KW, Chen CY, Stein MB, et. al. Assessment of bidirectional relationships between physical activity and depression among adults: a 2-sample medelian randomization study. JAMA Psychiatry:doi:10.1001/ jamapyschiatry.2018.4175 (Published online January 23, 2019: E1-10)

Cieza, A., Causey, K., Kamenov, K., Hanson, S. W., Chatterji, S., & Vos, T. (2021). Global estimates of the need for rehabilitation based on the Global Burden of Disease study 2019: a systematic analysis for the Global Burden of Disease Study 2019. The Lancet, 396(10267), 2006–2017.

Cyriax J: Mechanism of Symptoms: Dural pain. Lancet 29 (April):919-921,1978.

Cyriax J. Textbook of Orthopaedic Medicine. Volume One: Diagnosis of Soft Tissue Lesions, 6th Edition. Bailliére Tindall, London, 1975.

Da Costa BR, Vieira ER. Risk factors for work-related musculoskeletal disorders: a systematic review of recent longitudinal studies. Am J Ind Med 53 (3): 285-323, 2010.

Espinoza Oriass AA, Mitchell UH, Bowden JA, et. Al. Longterm running in middle-aged men and intervertebral disc health, a cross-sectional pilot study. PLoS ONE. 2020; 15:e0229457.

Gries KJ, Raue U, Perkins RK, et. Al. Cardiovascular and skeletal muscle health with lifelong exercise. J Applied Physiol (2018) 125 (5): 1636-45.

Guzman J, Hurwitz EL, Carroll LJ, Haldeman S, Côté P, Carragee EJ, Peloso PM, van der Velde G, Holm LW, Hogg-Johnson S, Nordin M, Cassidy JD. A New Conceptual Model of Neck Pain: Linking Onset, Course, and Care: The Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders Spine 33(4S): S14-23, 2008.

Hamberg-van Reenen HH, van der Beek AJ, Blatter BM, et. Al. Does musculoskeletal discomfort at work predict future musculoskeletal pain? Ergonomics 51 (5), 637-48, 2008.

Hämmig O, Knecht M, Läubli T, Bauer GF. Work-life conflict and musculoskeletal disorders: a cross-sectional study of an unexplored association. BMC Musculoskelet Disord 2011 Mar 16;12:60.

Hartvigsen J, Hancock MJ, Kongsted A, et al. What low back pain is and why we need to pay attention. Lancet 2018; 391: 2356–67.

Hutting N, Caneiro JP, Ong'wen OM, et. Al. Patient-centered care in musculoskeletal practice: Key elements to support clinicians to focus on the person. Musculoskeletal Sci Prac 57 (2022) 102434.

Kolski MC, O'Connor A. A World of Hurt: a guide to classifying pain. Thomas Land Publishers, St. Louis, 2015.

Langer E. Counterclockwise: Mindful Health and the Power of Possibility. Ballantine Books; 2009.

Laslett M, Young SB, Aprill CN, Diagnosing painful sacroiliac joints: a validity study of a McKenzie evaluation and sacroiliac provocative tests. McDonald B. Australian Journal of Physiotherapy 49: 89-97, 2003.

Laslett M, Aprill CN, McDonald B, Young S. Diagnosis of sacroiliac joint pain: validity of individual provocation tests and composite tests. Manual Therapy 10(3): 207-18, 2005.

Laslett M, William M: The reliability of selected pain provocation tests for sacroiliac joint pathology. Spine 19 (11): 1243-1249, 1994.

McKenzie RA: A Perspective on Manipulative Therapy. Physiotherapy 75 (8): 440-444, 1989.

Nordin M 2000 International society of the study of the lumbar spine presidential address: backs to work: some reflections. Spine 26 (8): 851-856, 2001.

Peper E, Harvey R., Faass N. Tech stress: how technology is hijacking our lives, strategies for coping, and pragmatic ergonomics. North Atlantic Books, Berkley, CA, 2020.

Rath WW, Rath JD. Prevention of Musculoskeletal Injury. In: Rothman J, Levine R (eds). Prevention Practice: strategies for physical therapy and occupational therapy. WB Saunders, Philadelphia: 74-114, 1992.

Rath W. Standardization of terms used in the assessment of pain/symptom responses when mechanical forces are applied to the musculoskeletal system of the human body. McKenzie Institute Newsletter, US. 1 (4), 25 – 30, 1993.

Rath W. Meeting the healthcare challenge: the marriage of quality and cost. McKenzie Institute Newsletter 2(2): 3 – 5, 1994.

Rath W. Outcome assessment in clinical practice. The McKenzie Institute Journal. 4(3): 9-16, 1996.

Rath W, Rath JD. Lumbar and cervical nerve root entrapment of discal origin – a consecutive case series investigation. 5th International McKenzie Conference, Wyndham Franklin Plaza, Philadelphia, Sep 14, 1997.

Rath W. Clinical practice: it is both art and science. The McKenzie Journal 6(1): 5, 1998.

Rath JD, Rath W, Mielcarsky E, Waldman R. Low back pain in pregnancy: helping patients take control. The Journal of Musculoskeletal Medicine. 17 (4): 223 –232, 2000.

Rath W. Spinal manipulation and the prevention of dysfunction and disability. Combined Sections APTA, Orthopaedic Section: The Integration of Manual Therapy & Musculoskeletal Wellness, Boston, Feb. 23, 2002.

Rath W. The importance of exercise and activity to the treatment and prevention of work-related musculoskeletal disorders and disability. 2003; Presented at the Onondaga Medical Society.

Rath W. Prevention strategies for activity-related spinal disorders: recalibrating your clinical tools. APTA Pre-conference workshop, Salt Lake City, UT, June 26, 2013.

Rath W, Rath JD. Duffy-Rath System: An Introduction: a prevention-based approach for cumulative musculoskeletal disorders and disability – clinician's edition. 2014: ISBN:0615999174

Santos-Parker JR, Santos-Parker KS, McQueen MB, et. Al. Habitual aerobic exercise and circulating proteomic patterns in health adults: relation to indicators of healthspan. J Applied Physiol (2018) 125 (5): 1646-59.

Spitzer WO, LeBlanc FE, Dupuis M, et al: Scientific Approach to the Assessment and Management of Activity-related Spinal Disorders. Spine 12 (7S), 1987.

Sun Q, Townsend MK, Okereke OI, et. al. Physical activity at midlife in relation to successful survival in women at age 70 years or older. Archives Internal Medicine (2010) 170 (2): 194-201.

Turk DC, Melzack R. Handbook of Pain Assessment, 3rd Ed. 2011, Guilford Press, New York, London.

Vadala G, DiGiacomo G, Ambrosio L. Effect of irisin on human nucleus pulposus cells: new insights into the biological cross-talk between muscle and intervertebral disk. Spine 2023; 48 (7): 468-75.

Williams A, Kamper SJ, Wiggers JH, O'Brien KM, Lee H, Wolfenden L, Yoong SL, Robson E, McAuley JH, Hartvigsen J, Williams CM. Musculoskeletal conditions may increase the risk of chronic disease: a systematic review and meta-analysis of cohort studies. BMC Medicine 2018;16:167

Yan Liang Y, Feng H, Chen Y, et. Al. Joint association of physical activity and sleep duration with risk of all-cause and cause-specific mortality: a population-based cohort study using accelerometry. Euro J Prev Cardio (2023) 00. 1-12. https://doi.org/10.1093/eurojpc/zwad060

Thompson, WG The Placebo Effect and Health: combining science and compassionate care. 2005, Prometheus Books, Amherst, NY.

United States Bone and Joint Initiative: The Burden of Musculoskeletal Diseases in the United States (BMUS), Third Edition, 2014. Rosemont, IL. Available at http://www.boneandjointburden.org. Accessed on March 7, 2023. ISBN: 978-0-9963091-0-3

