
University of Maryland Center for Integrative Medicine Health and Wellness Conference May 4, 2013
John C. Reed, MD, MDiv
Manual Therapies and Pain Management: Who Cares?

- Cultural, sociological, anthropological, political
- Clinical management (health professionals)
- Regulatory and policy
- Reimbursement/payer (employers, insurance, etc)
- Patient (health consumer)
## Evidence-Based Health as Consumer/Clinician Advisory Guide

<table>
<thead>
<tr>
<th>Level of Evidence*</th>
<th>Actions Supported</th>
</tr>
</thead>
</table>
| High and Moderate quality POSITIVE evidence | • Supports public **favorable** claims regarding effectiveness  
• Advise patients that this is an effective treatment choice |
| INCONCLUSIVE, but favorable evidence | • Does not support any public claims regarding effectiveness  
• Recommend effective alternative if available  
• Advise patients that this is a treatment option in the absence of an effective alternative |
| INCONCLUSIVE, and unclear direction of evidence | • Recommend effective alternative if available  
• Advise patients that the effectiveness of this treatment option has not been established |
| INCONCLUSIVE, but non-favorable evidence | • Advise patients that this treatment option is unlikely to be effective  
• Recommend effective alternative if available |
| High and Moderate quality NEGATIVE evidence | • Advise patients AGAINST this as a treatment option  
• Recommend effective alternative if available |

*See definitions for levels of evidence within the methods section.
It has been shown that Osteopathic Manual Therapy [OMT] for chronic spinal pain yields better results than acupuncture and pain meds and requires less physical therapy.\textsuperscript{1,2,3} 


## RCTs of Spinal Manipulation

<table>
<thead>
<tr>
<th>Condition</th>
<th>+ RCTs</th>
<th>Equiv RCTs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute LBP</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Chronic LBP</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Mixed LBP</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Migraine</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>MT HA</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Neck pain</td>
<td>4</td>
<td>7</td>
</tr>
</tbody>
</table>

From Meeker, W.C., Framing Integration into the Chiropractic Community, presentation, 2001
# RCTs of Spinal Manipulation

<table>
<thead>
<tr>
<th>Condition</th>
<th>+ RCTs</th>
<th>Equiv RCTs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dysmenorrhea</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Infantile Colic</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Enuresis</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Asthma</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>PMS</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

From Meeker, W.C., Framing Integration into the Chiropractic Community, presentation, 2001
# Studying the Studies

<table>
<thead>
<tr>
<th>Data included in Bronfort Et. Al. 2010 Manual Therapy Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>49 Systematic Reviews</td>
</tr>
<tr>
<td>16 Evidence based guidelines</td>
</tr>
<tr>
<td>46 RCT’s not included in the systematic reviews</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level of Evidence</th>
<th>Criteria</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Quality</td>
<td>• At least two consistent higher quality RCTs with low risk of bias</td>
<td>Recommendations are unlikely to change based on future studies</td>
</tr>
<tr>
<td>Moderate Quality</td>
<td>• At least one higher quality study (low risk of bias) with statistical power, 2+ RCT of higher quality with some inconsistency, at least 2 lower quality RCT’s with moderate risk of bias,</td>
<td>Evidence is sufficient to make recommendation but confidence is constrained</td>
</tr>
</tbody>
</table>
| Inconclusive-low quality | • Limited number or power of studies  
  • Flaws in design or methods (high risk of bias)  
  • Unexplained inconsistency between higher quality studies  
  • Gaps in evidence chain  
  • Finding not generalizable to routine practice  
  • Lack of info on important outcomes                                                                                                   | Evidence is insufficient to make a recommendation Relative to health outcomes                |

### Level of Evidence and Summary Grades for Noninvasive Interventions in Patients with Acute Low Back Pain

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Level of Evidence</th>
<th>Net Benefit</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaminophen</td>
<td>Fair</td>
<td>Moderate</td>
<td>B</td>
</tr>
<tr>
<td>Nonsteroidal anti-inflammatory drugs</td>
<td>Good</td>
<td>Moderate</td>
<td>B</td>
</tr>
<tr>
<td>Skeletal muscle relaxants</td>
<td>Good</td>
<td>Moderate</td>
<td>B</td>
</tr>
<tr>
<td>Superficial heat</td>
<td>Good</td>
<td>Moderate</td>
<td>B</td>
</tr>
<tr>
<td>Advice to remain active</td>
<td>Good</td>
<td>Small (no significant harms)</td>
<td>B</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>Fair</td>
<td>Moderate</td>
<td>B</td>
</tr>
<tr>
<td>Opioids and tramadol</td>
<td>Fair</td>
<td>Moderate</td>
<td>B</td>
</tr>
<tr>
<td>Self-care education books</td>
<td>Fair</td>
<td>Small (no significant harms)</td>
<td>B</td>
</tr>
<tr>
<td>Herbal therapies</td>
<td>Fair (devil’s claw and white willow bark) to poor (cayenne)</td>
<td>Moderate (devil’s claw and white willow bark), unable to estimate (cayenne)</td>
<td>B (devil’s claw and white willow bark)</td>
</tr>
<tr>
<td>Spinal manipulation</td>
<td>Fair</td>
<td>Small to moderate</td>
<td>B/C</td>
</tr>
<tr>
<td>Advice to rest in bed</td>
<td>Good</td>
<td>No benefit</td>
<td>D</td>
</tr>
<tr>
<td>Exercise therapy</td>
<td>Good</td>
<td>No benefit</td>
<td>D</td>
</tr>
<tr>
<td>Systemic corticosteroids</td>
<td>Fair</td>
<td>No benefit</td>
<td>D</td>
</tr>
<tr>
<td>Aspirin</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
<tr>
<td>Acupuncture</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
<tr>
<td>Back schools</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
<tr>
<td>Interferential therapy</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
<tr>
<td>Low-level laser</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
<tr>
<td>Lumbar supports</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
<tr>
<td>Massage</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
<tr>
<td>Modified work</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
<tr>
<td>Shortwave diathermy</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
<tr>
<td>Transcutaneous electrical nerve stimulation</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
<tr>
<td>Superficial cold</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
</tbody>
</table>

*See Appendix Tables 1, 2, and 3 for explanation of grades. Low back pain is considered acute if its duration is <4 weeks.*

## Level of Evidence and Summary Grades for Noninvasive Interventions in Patients with Chronic or Subacute Low Back Pain

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Level of Evidence</th>
<th>Net Benefit</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaminophen</td>
<td>Fair</td>
<td>Small (no significant harms)</td>
<td>B</td>
</tr>
<tr>
<td>Acupuncture</td>
<td>Fair (some inconsistency vs. sham acupuncture)</td>
<td>Moderate</td>
<td>B</td>
</tr>
<tr>
<td>Psychological therapy</td>
<td>Good for cognitive-behavioral, fair for progressive relaxation</td>
<td>Moderate (cognitive-behavioral) to substantial (progressive relaxation)</td>
<td>B</td>
</tr>
<tr>
<td>(cognitive-behavioral therapy or progressive relaxation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise therapy</td>
<td>Good</td>
<td>Moderate</td>
<td>B</td>
</tr>
<tr>
<td>Interdisciplinary rehabilitation</td>
<td>Good</td>
<td>Moderate</td>
<td>B</td>
</tr>
<tr>
<td>Nonsteroidal anti-inflammatory drugs</td>
<td>Good</td>
<td>Moderate</td>
<td>B</td>
</tr>
<tr>
<td>Spinal manipulation</td>
<td>Good</td>
<td>Moderate</td>
<td>B</td>
</tr>
<tr>
<td>Opioids and tramadol</td>
<td>Fair (primarily indirect evidence from trials of patients with other pain conditions)</td>
<td>Moderate</td>
<td>B</td>
</tr>
<tr>
<td>Brief individualized educational interventions</td>
<td>Fair</td>
<td>Moderate</td>
<td>B</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>Fair</td>
<td>Moderate</td>
<td>B</td>
</tr>
<tr>
<td>Massage</td>
<td>Fair</td>
<td>Moderate</td>
<td>B</td>
</tr>
<tr>
<td>Yoga</td>
<td>Fair (for Viniyoga) to poor (for Hatha yoga)</td>
<td>Moderate (Viniyoga), unable to estimate (Hatha yoga)</td>
<td>B (Viniyoga)</td>
</tr>
</tbody>
</table>
### Level of Evidence and Summary Grades for Noninvasive Interventions in Patients with Chronic or Subacute Low Back Pain-2

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Level of Evidence</th>
<th>Net Benefit</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tricyclic antidepressants</td>
<td>Good</td>
<td>Small to moderate</td>
<td>B/C</td>
</tr>
<tr>
<td>Antiepileptic drugs</td>
<td>Fair (for gabapentin) to poor (for topiramate)</td>
<td>Small (gabapentin in patients with radiculopathy), unable to estimate (topiramate)</td>
<td>C (gabapentin), I (topiramate)</td>
</tr>
<tr>
<td>Back schools</td>
<td>Fair (some inconsistency)</td>
<td>Small</td>
<td>C</td>
</tr>
<tr>
<td>Firm mattresses</td>
<td>Fair</td>
<td>No benefit or harm</td>
<td>D</td>
</tr>
<tr>
<td>Traction</td>
<td>Fair</td>
<td>No benefit (continuous or intermittent traction), small to moderate (autotraction for sciatica)</td>
<td>D (continuous or intermittent traction), C (autotraction for sciatica)</td>
</tr>
<tr>
<td>Aspirin</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
<tr>
<td>Biofeedback†</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
<tr>
<td>Interferential therapy</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
<tr>
<td>Low-level laser</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
<tr>
<td>Lumbar supports</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
<tr>
<td>Shortwave diathermy</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
<tr>
<td>Skeletal muscle relaxants</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
<tr>
<td>Transcutaneous electrical nerve stimulation</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
<tr>
<td>Ultrasonography</td>
<td>Poor</td>
<td>Unable to estimate</td>
<td>I</td>
</tr>
</tbody>
</table>

* See Appendix Tables 1, 2, and 3 for explanation of grades. Low back pain is considered subacute at 1–3 months’ duration and chronic at >3 months’ duration.

† The use of auditory or visual signals reflecting muscle tension or activity to learn how to inhibit or reduce the muscle activity.
Recommendation #5: Provide information on self care, expected course and remaining active *(strong reco, moderate quality evidence)*

Recommendation #6: Baseline functional deficit, pain, and risk assessment, use of APAP and NSAIDs. *(strong reco, moderate quality evidence)*

Recommendation #7: If not improving with self management consider non-pharmacologic therapy:
- Acute back pain: **Spinal manipulation**, Chronic or subacute back pain: interdisciplinary rehab, exercises, acupuncture, **massage, spinal manipulation**, yoga, CBT, progressive relaxation. *(weak reco, moderate quality evidence)*

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**Interventions (Recommendations 5, 6, 7)**

<table>
<thead>
<tr>
<th>Self-care</th>
<th>Low Back Pain</th>
<th>Acute</th>
<th>Subacute or Chronic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>&lt; 4 Weeks</td>
<td></td>
<td>&gt; 4 Weeks</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pharmacologic therapy</th>
<th>Low Back Pain</th>
<th>Acute</th>
<th>Subacute or Chronic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advice to remain active</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Books, handout</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Application of superficial heat</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Acetaminophen</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>NSAIDs</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Skeletal muscle relaxants</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Antidepressants (TCA)</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Tramadol, opioids</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Spinal manipulation</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Exercise therapy</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Massage</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Acupuncture</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Yoga</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Cognitive-behavioral therapy</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Progressive relaxation</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Intensive interdisciplinary rehabilitation</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
</tbody>
</table>

*Interventions supported by grade B evidence (at least fair-quality evidence of moderate benefit, or small benefit but no significant harms, costs, or burdens). No intervention was supported by grade A evidence (good-quality evidence of substantial benefit).*

Downloaded from: http://annals.org on 4/7/13
Clinical Gaps in Back Pain Care

• Under-referral to non-surgical spine-therapy professionals

• Ineffective pain management approaches

• Inadequate screening for behavioral health conditions

• Poor physician adherence to guideline recommendations and clinical utilization metrics for surgery and imaging

• Poor usage of self-care strategies by patients

- What is the research suggesting manual therapies can impact the nervous system? Immune system?
- Endocrine system?
- Within these scientific disciplines, what additional research would add most to our understanding of the biology of manual therapies?
- How do manual therapies impact the biomechanics of the body?
- What foundational biomechanics underlie the therapies themselves?
- What additional research on biomechanics would add most to our understanding of the biology of manual therapies?
- What type of study designs would facilitate research on the underlying biology of manual therapies?
- What would be the key outcome measures?
- Are there objective measures that are able to capture changes in structure or function hypothesized to underlie these therapies?
- What state-of-the-art methods in neuroscience, immunology, endocrinology, biomechanics and imaging can be applied to studies of the biology of manual therapies?
- What are the three to five most critical research questions (or needs) to help us understand the biology of manual therapies?

DOI: 10.1016/j.jmpt.2006.04.002
What do Manual Therapies Treat?

Definition of Somatic Dysfunction

- **Somatic Dysfunction is:**
  - Impaired or altered function of related components of the somatic system. (Skeletal, joint, and myofascial structures, plus related vascular, lymphatic, and neural elements.)
  - Treatable using manual therapy procedures.
Acute Somatic Dysfunction is:
- Immediate or short-term impairment or altered function of related components of the somatic system characterized by:
  - Vasodilation
  - Edema
  - Tenderness
  - Pain
  - Tissue contraction
Somatic Dysfunction – Definitions-3

- Chronic Somatic Dysfunction is:
  - Impairment or altered function of related components of the somatic system, characterized by:
    - Tenderness
    - Itching
    - Fibrosis (scarring)
    - Paresthesias
    - Tissue contraction
Primary Somatic Dysfunction is:

- The somatic dysfunction that is the initial or first somatic dysfunction to appear in a time sequence, often as the result of a traumatic injury of a physical or emotional sort that was absorbed in the person’s physical and neurological information system. It is the dysfunction that maintains a total pattern of dysfunction in the biomechanical, neurological, and fluid exchange systems of the body.
Secondary Somatic Dysfunction is:
- Somatic Dysfunction arising from either mechanical or neurophysiologic response that follows or is a result of other abnormalities in the body.
- Example: Sacral joint and motion dysfunction resulting from the mechanical strain of leg length discrepancy and/or viscerosomatic or somatovisceral reflexes from pelvic organ problems.
Somatic Dysfunction – Definitions

- Somatic Dysfunction may be diagnosed by identifying PART:
  - P alpatory changes in tissue texture
  - A symmetry of motion
  - R estriction of motion
  - T enderness

- The presence of any one of the PART criteria is justification for the diagnosis of somatic dysfunction.
The logic of western science and medicine is Aristotelian – it is linear in thought.

The system is understood as a sequence of incidents on a single line.
Holistic logic is decidedly non-linear and more resembles a Taoist outlook.

Various forces act upon the individual, the outcome is the development of dysfunction, disease or the maintenance of health.

Various combinations of factors can lead toward healthy states from dysfunction and disease.
Beyond Population Evidence
Clinical Decision Making for Pain Patients
Understanding Manual Treatment of Somatic Pain Syndromes

- How do manual therapies impact the nervous system?
- How do manual therapies impact the biomechanics of the body?
- What biomechanical processes underlie the application of manual therapies
Kinds of Pain

To alleviate pain effectively, it is essential to adequately assess its source, or sources.

Nociceptive Pain. Specialized pain receptors on the tips of nerve cells react to:

- Extreme temperatures.
- Pressure.
- Substances released by other cells.
- Burns.
- Cuts.
- Inflammation.
- Infections.
- Severe lack of oxygen.
- Excessive pressure within or stretching of an organ.
Kinds of Pain

- **Neuropathic Pain.** Sensation of pain that can result when nerves become abnormally active.
- Examples include diabetic neuropathy, postherpetic neuralgia, and phantom limb phenomenon.
- **Etiology often difficult to identify and treat:**
  - no standard diagnostic protocol.
  - no consensus on optimal treatment.
- Neuropathic, nociceptive, and idiopathic pain may coexist.
- **Treatment may involve drug therapies, invasive therapies (ablative surgery, nerve blocks), and alternative therapies.**
Kinds of Pain

- Psychogenic Pain. When no physical cause of pain can be identified, psychological causes should be explored.

- No matter what the cause, the subjective sensation of pain varies with every person and can be influenced by:
  - an individual’s attention to pain.
  - cultural learning.
  - perceived meaning of the situation.
  - any number of psychological variables.
The Mode/Model of Pain Affects the Treatment Recommendations

<table>
<thead>
<tr>
<th>Biomedical model</th>
<th>Biopsychosocial model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most appropriate for acute pain conditions</td>
<td>More useful for those with chronic pain conditions</td>
</tr>
<tr>
<td>Emphasizes peripheral nociception</td>
<td>Recognizes the role that central mechanisms play in modulating peripheral nociception</td>
</tr>
<tr>
<td></td>
<td>or generating the experience of pain in the absence of nociception</td>
</tr>
<tr>
<td>Focus on physical disease mechanisms</td>
<td>Recognizes the importance of illness behavior including cognitive and emotional responses to pain</td>
</tr>
<tr>
<td>Reductionistic approach to understanding and treating pain</td>
<td>Multidimensional systems approach to understanding and treating pain</td>
</tr>
<tr>
<td>Reliance on medical management approaches</td>
<td>Utilization of self-management approaches</td>
</tr>
</tbody>
</table>

California State Chronic Pain Medical Treatment Guidelines, Medical Treatment Utilization Schedule (July 18, 2009), downloaded 4/6/13 from http://www.dir.ca.gov/dwc/DWCPropRegs/MTUS_Regulations/MTUS_ChronicPainMedicalTreatmentGuidelines.pdf
Integrated Therapy Model of Healthy Functioning

AT Still, founder of Osteopathy used:

“MIND”
“MATTER”
“MOTION”
Osteopathic Models of
Biomechanical Diagnosis and Therapy

Postural and Structural Model:
Smooth movement through the environment, minimizing stress of moving joints and bones in gravity field, Effective power, control, and recovery of muscle activity.

Fluid Exchange Model:
Blood flow in capillaries, extracellular and intracellular exchange for nourishment and oxygenation. Lymphatic and venous flow to remove waste products, healthy fluid circulation through muscles and internal organs.

Neurologic Integration Model:
Effective and accurate information flow from internal and external sensors, responsive neurotransmitter interactions, sympathetic/parasympathetic balance, neural learning and neural plasticity for adapting to stress, sensorimotor integration, neural and psychic resilience in spite of post-traumatic stress after unexpected neurodevelopmental, physical, social, and lifestyle events
Posture and Structure

Smooth movement through the environment, minimizing stress of moving joints and bones in gravity field, Effective power, control, and recovery of muscle activity. These depend upon:
- Neurology of Joints and Muscles
- Joint range of motion
- Postural Balance and Tensegrity
Posture and Gravity

- This leads to commonly found somatic dysfunctions and pain, which can become chronic.

- If the abnormal weight bearing is not addressed, commonly used therapies to relieve pain may not produce the desired long-term effect.

- As part of the standing structural examination of the physical exam, the patient should be observed for increased or decreased anterior and posterior spinal curves.

- Also note the postural alignment of the weight-bearing line
Posture and Gravity
Van Buskirk offers a nociceptively rooted, neurological model, for spinal somatic dysfunction as follows:

- A peripheral focus of irritation results in activation of nociceptive [responsive to irritation and pain] neurons. These may be somatosensory or general visceral afferent neurons.

Structure and Function

✧ These primary afferent neurons synapse in the dorsal horn with internuncial neurons (which travel up and down the cord synapsing at several levels).
✧ Ongoing afferent stimulation of intensity insufficient to fire the internuncial neurons results in a state of irritability (facilitation).
Structure and Function

✧ A focus of irritation producing spinal facilitation can affect structures in segmentally-related dermatomes, myotomes, sclerotomes, and “viscerotomes.”

✧ Through somatovisceral, somatosomatic, viscerosomatic, and viscerovisceral reflexes the spinal cord links seemingly unrelated systems and structures in a manner that can fosters a non linear clinical system of logic, rendering it more inclusive or holistic.
Manual Therapy and the Nervous System

Since there is a close relationship between spinal vertebrae and the autonomic nervous system, the neuromuscular system plays a vital role in homeostasis of all other systems.
Dysafferentation, a Dysfunction of the Biomechanical Somatosensory System

Joint Receptors
- Interstitial nociceptors in all the connective tissue in and around the joint
- Mechanical nociceptors- A delta fibers
- Mechanothermal nociceptors,- A delta fibers
- Silent nociceptors- Unmyelinated C fibers
- Polymodal nociceptors- Unmyelinated C fibers

Joint receptors are not usually set off by everyday activities but peripheral sensitization can occur, usually chemically mediated

Central sensitization in the brain and spinal cord can follow or occur concurrently with peripheral sensitization

A Dysafferentation complex of numerous unrelated symptoms can [occur] when nociceptive input is enhanced and mechanoreceptor input is decreased.

Muscle Receptors
- Muscle Spindles and gamma motor neurons, within the muscles- rate of change of length and strength sensitivity, Ia and Ii fibers manage dynamic and static reflexes
- Golgi Tendon Organs- respond to rapid change in tension at tendinomuscular junctions and bony insertions

**Dysafferentation, a Dysfunction of the Biomechanical Somatosensory System**

What Happens During Manual Therapy - Range of Joint Motion

What Happens During Manual Therapy- Setup-1

What Happens During Manual Therapy- Setup-2

What Happens During Manual Therapy- Setup-3

What Happens During Manual Therapy- Thrust Maneuver

Segmental Sympathetic Influence on Genito-Urinary System

- Ureters T11-L3 bilateral or ipsilateral
- Bladder - T11-L3 bilateral
- Prostate - T10-L2 bilateral
- Ovaries (testes) T10-T11 bilateral or ipsilateral
- Fallopian Tubes – T10-L2 bilateral or ipsilateral
- Uterus – T9-L2 bilateral
- Kidneys - T9-L1 bilateral or ipsilateral
Segmental Parasympathetic Influence on Genito-Urinary System

- Kidneys - C0, C1, C2
- Ureters, proximal C0, C1, C2 and distal S2-S4
- Bladder - S2-S4
- Prostate - S2-S4
- Fallopian Tubes - S2-S4
- Uterus - S2-S4
OMT and Chemical Information Transmitters- 1

- Increases Nitric Oxide (NO), endocannabinoids, and other NO-stimulating signaling molecules leading to the “relaxation response”.¹
- The CV-4 compression maneuver is thought to hydrostatically activate cannabinoid receptors because of their prevalence in the periaqueductal gray region.²

OMT and Chemical Information

Transmitters- 2

- Distortions and mechanical stress at the cranial sphenoid bone can contribute to pituitary dysfunctions because of their anatomic relationship.¹

- OMT has been shown to increase axoplasmic flow and restore nerve receptors, as well as improve nerve conduction.¹

- Cranial manipulation affects blood flow velocity oscillation via the low frequency Traube-Herring-Meyer components that affect the autonomic nervous system.²


Treatment Considerations

- There is an inseparable relationship between viscerosomatic and somatovisceral reflexes as a result of spinal facilitation. Differentiating between the two is often difficult.

- Specific evidence based therapies should be employed to treat the visceral pathology and OMT should be employed integratively, using its effect upon somatovisceral physiology.


Tensegrity

Tensegrity (tension-integrity) is a structural system recognized for its distinct compression elements that appear to float within a tensioned network. It is a most attractive proposition in living systems because such structures automatically assume a position of stable equilibrium with a configuration that minimizes their stored elastic energy. Tensegrity structures allow movement with the minimum of energy expenditure without losing stiffness or stability. Comparisons with biological structures show them both to have non-linear viscoelastic properties, with fluid-like movements that result from the integration of all components in the system.

Bio-tensegrity is increasingly recognized as a better way to understand biology because it integrates anatomy from the molecular level to the whole organism.

For more reading and info see: http://www.intensiondesigns.com/
Fascial as a Postural Structural Element

Myofascial Release is a component of manual therapy used by PT’s, DC’s DO’s, massage therapists, and Rolfing – Structural Integration practitioners.

Fascial has visco-elastic biomechanical properties and can absorb acute trauma as well as adapt like shrink-wrap to chronic postural holding patterns
Fascial as a Postural Structural Element

# Fascial Neural Receptors and Reflexes

## Mechanoreceptors in Fascia

<table>
<thead>
<tr>
<th>Receptor type</th>
<th>Preferred location</th>
<th>Responsive to</th>
<th>Known results of stimulation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Golgi</strong></td>
<td>Myotendinous junctions, attachment areas of aponeuroses, ligaments of peripheral joints, joint capsules.</td>
<td>Golgi tendon organ: to muscular contraction. Other Golgi receptors: probably to strong stretch only</td>
<td>Tonus decrease in related striated motor fibers.</td>
</tr>
<tr>
<td><strong>Pacini &amp; Paciniform</strong></td>
<td>Myotendinous junctions, deep capsular layers, spinal ligaments, investing muscular tissues.</td>
<td>Rapid pressure changes and vibrations</td>
<td>Used as proprioceptive feedback for movement control (sense of kinesthesia).</td>
</tr>
<tr>
<td><strong>Ruffini</strong></td>
<td>Ligaments of peripheral joints, Dura mater, outer capsular layers, and other tissues associated with regular stretching.</td>
<td>Like Pacini, yet also to sustained pressure. Specially responsive to tangential forces (lateral stretch).</td>
<td>Inhibition of sympathetic activity.</td>
</tr>
<tr>
<td><strong>Interstitial</strong></td>
<td>Most abundant receptor type. Found almost everywhere, even inside bones. Highest density in periosteum.</td>
<td>Rapid as well as sustained pressure changes. 50% are high threshold units, and 50% are low threshold units</td>
<td>Changes in vasodilation plus apparently in plasma extravasation.</td>
</tr>
</tbody>
</table>

Myofascial Effects on the Body

Central Reflexes

- Muscle Tone

Autonomic Reflexes

- Fluid Dynamics

Palpable tissue response → Tissue manipulations → Stimulation of mechanoreceptors

Local fluid dynamics → Autonomic Nervous System

Tonus change of related skeletal motor units

Central Nervous System

Stimulation of mechanoreceptors
Biopsychosocialspiritual
Integrative manual approaches

Thomas Myer’s – Anatomy Trains,
the Anatomy of Connection in
the Fascial planes

The Spirited Body, a workshop by Tom Myers

Written in your body is your entire story. But the body gets stuck and blocks that story from unfolding. This workshop uses bodywork, voice work, movement, and body-centered meditations to gently expose and advance these unfinished stories.

Grounded in contemporary somatic science woven with the spiritual traditions from Sufism, Feldenkrais, and other esoteric practices, this course will stretch your being, open your voice, and give you more capability to create meaning in your outside life. Minimal process-talk, maximal experience - come prepared to work / play / move. Help your inside match the outside and vice versa - energize your own physically spirited body with three days of expressive fun, deep exploration, and giving the soft animal of your body room to love what it loves.
# Osteopathic Manipulative Therapy

<table>
<thead>
<tr>
<th>Type</th>
<th>Style</th>
<th>Treatment Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Velocity Low Amplitude Thrust = “Manipulation”</td>
<td>Direct</td>
<td>Structure/Posture</td>
</tr>
<tr>
<td>Muscle Energy</td>
<td>Indirect</td>
<td>Structure/Neurologic</td>
</tr>
<tr>
<td>Counterstrain</td>
<td>Indirect</td>
<td>Structure/Posture</td>
</tr>
<tr>
<td>Functional Methods –ROM and oscillation = “Mobilization”</td>
<td>Direct/Indirect</td>
<td>Structure/Fluid</td>
</tr>
<tr>
<td>Myofascial Release</td>
<td>Direct</td>
<td>Structure/Fluid</td>
</tr>
<tr>
<td>Cranial /Sacral</td>
<td>Direct/Indirect</td>
<td>Fluid/ Neurologic</td>
</tr>
</tbody>
</table>
Clinical Example

The patient presents with abnormal sensations of the palmar surface of the right hand consistent with a diagnosis of “carpal tunnel syndrome of uncertain etiology”.

Considering the osteopathic system of logic, one would take into consideration:

1. The sympathetic nerve supply for the upper extremity arises from the first through fourth thoracic spinal segments [T₁-T₄].
Clinical Example

2. Right-sided upper thoracic segmental dysfunction can result from postural accommodation to pelvic unleveling or from environmental stresses with resultant symptoms referable to the right hand.

3. The upper thoracic region also receives general visceral afferent input from the myocardium, lungs and esophagus.
Clinical Example

4. Pathology in any of the aforementioned organs may cause facilitation of the upper thoracic segments, or conversely, facilitation of the upper thoracic segments may cause visceral reflex responses.

5. Sympathetic afferent neurons from the right upper arm are also capable of producing facilitation in the upper thoracic region lateralizing to the right.

6. Further, somatic dysfunction of minor intensity may be amplified by mind-body reactions to emotional stress.
Clinical Example

7. Upper thoracic facilitation can result in segmentally related soft tissue edema. In this instance affecting the contents of the carpal tunnel of the arm on the same side.

8. Thus carpal tunnel symptoms may result from, or be aggravated by upper thoracic facilitation resulting from many sources.
Clinical Example

As such, the symptoms of carpal tunnel syndrome may be:

1. The result of organic pathology of the wrist. [scarring, fibrosis, and overuse stress on fascia around the median nerve]
2. A manifestation of a somatosomatic reflex from upper thoracic somatic dysfunction, either primary or postural accommodation.
3. A reflex from visceral pathology.
From this description of the mechanics and physiology of spinal somatic dysfunction, a logical argument can be made as to how one might:

1. Alleviate a tachyarrhythmia by treating carpal tunnel syndrome.
2. Use a PPI, or H2 blocker, to decrease the inflammation of reflux esophagitis (viscerosomatic reflex T3 right), thereby reducing the median nerve edema of a right-sided carpal tunnel syndrome.
Integrative manual care employs a system of logic that sets contemporary osteopathic and integrative physicians apart from other allopathic medical practitioners.

The logic of allopathic evidence-based care does not correspond to the clinical logic of manual therapy. The current evidence research can inform the consumer public but cannot replicate the effect of an acute specialist in manual therapies.
Manual Therapy and the Patient with Chronic Pain

- Approximately 85 percent of back pain is idiopathic to the allopathic profession, when the etiology in many of these patients is somatic dysfunction.

- Manual therapy intervention can be very cost effective by avoiding expensive workups and invasive interventions.

- Manual therapy can be synergistic with other therapies: invasive injections, nutritional therapy, drug therapy, psychotherapy.

- Some chronic pain patients who do not initially respond to manual therapy begin to respond as part of a coordinated care plan using multiple therapies concurrently.

- For patients with chronic pain, even when somatic dysfunctions are corrected, it may be necessary evaluate and treat them with manual therapy from two or three times per year to every three or four weeks.


Research Questions on Biology of Manual Therapies- 2006

1. Determine the effects of manual therapy in normal experimental animals and in animal models of tissue injury.
2. Does applying very superficial manual therapies, such as a light massage, that mainly activate skin afferents produce different effects on the nervous system, immune system, and endocrine system compared with manual therapies that also involve activation of muscle afferents?
3. Does paraspinal tissue have any unique physiology compared to appendicular tissues? Is this related to the reported clinical efficacy of manual therapies?
4. Do manual therapies produce long-lasting changes in the biomechanics of the spine, torso, or limbs? Are these changes associated with altered activity in the nervous system? Immune system? Endocrine system?
5. Identify valid, reliable biomechanical measures (e.g., posture, kinematics, kinetics, functional imaging) that can be used to distinguish between healthy and non-healthy tissues and to subcategorize patients/clients with musculoskeletal disorders.
6. Develop imaging techniques that can be used to capture dynamic in vivo responses to biomechanical signals in healthy and non-healthy tissues.

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