

Spinal Manipulation

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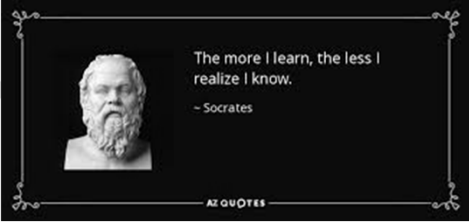
UND SCHOOL OF MEDICINE
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Disclosure

- S. Jake Thompson – No relevant financial relationship exists.

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The more I learn, the less I realize I know.
- Socrates

AZ QUOTES

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Presentation Objectives

- Be cognizant of safety issues regarding spinal manipulation.
- Recognize the current best evidence for the implementation of spinal manipulation in clinical practice

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SPINAL MANIPULATION

- **Guide to PT Practice-**
Mobilization/Manipulation = “A manual therapy technique comprised of a continuum of skilled passive movements to joints and/or related soft tissues that are applied at varying speeds and amplitudes, including a small amplitude/high velocity therapeutic movement”
- **Manipulation Education Committee, June 2003-**
Thrust Joint Manipulation (TJM)- *high velocity, low amplitude therapeutic movements within or at end range of motion.*

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SPINAL MANIPULATION

- PROS
 - Non pharm
 - Non surgical
 - Cost effective compared to exercise (UK BEAM 2002)
 - Safe (Oliphant 2004)
 - Current research is as strong as any other intervention (PT)

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SPINAL MANIPULATION

- Cons
 - Placebo
 - Western Medicine perception
 - Alternative Medicine
 - Poor face validity “out of alignment” and “subluxation theory”
 - Lack of an identifiable mechanism of action for MT may limit the acceptability of these techniques
 - Viewed as less scientific

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SPINAL MANIPULATION



Spinal Manipulation

- Spinal manipulation:
 - Depicted in cave drawings (14,500 BC)
 - Ancient china (2700 BC)
 - Hippocrates (470 BC)
 - Bonesetters (1800's)
 - Osteopaths (late 1800's)
 - Chiropractors 1895



Historical Perspective

DeKouch, Pitzer, M., Steadman Hawkins Sports Medicine Lecture Series: Chiropractic (2006)

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History of Manipulation

- Hippocrates, Father of Medicine
 - 460-355 B.C.
 - Wrote “On Setting Joints by Leverage”
 - Spinal Traction
 - Reduction of dislocated shoulders

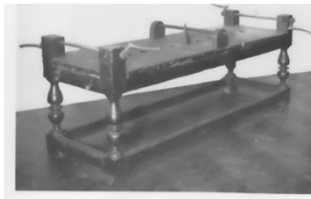


Fig. 2. A medical traction couch as used by Hippocrates and illustrated in Galen's *Chirurgia* (1544), discovered in 1923 near Urbino, Italy, and now in the Wellcome Historical Museum. (By courtesy of the trustees of the Wellcome Historical Museum)

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History of Manipulation

- Wharton Hood
 - 1871, “On Bone-setting”
 - first such book by an orthodox medical practitioner
 - Hood thought snapping sound was due to breaking adhesions
 - PT evolved from Medicine
 - Precedes Osteopathy and Chiropractic
 - In 1887, PTs were given official registration by Sweden's National Board of Health and Welfare
 - 1899 Chartered Society of Physiotherapy founded in England



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Osteopathy

- **Andrew Still founded Osteopathy in 1874**
- 1896 founded the first school of Osteopathy in Kirksville, Missouri
- “Rule of the Artery”- Manipulate the spine to restore blood flow and restore body's innate healing ability
- Osteopaths currently licensed to practice medicine in all states

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Physical Therapists/Manual Therapy

- Mary McMillan, 1st president of APTA (*founded 1921*)
 - *The four branches of physiotherapy: “namely-**manipulation** to muscle and joint, therapeutic exercise,... electrotherapy, and hydrotherapy.”*
 - McMillan M. Change of name [editorial]. *P. T. Review*. 1925b;5(4):3-4.
- 1925 – 1939: Yearly publications in Physical Therapy literature on Manipulation and related topics
- 1940 – mid 1970's: The word “manipulation” is not widely used in the literature
 - Mobilization/articulation used to separate PT from chiropractic

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James Cyriax

- British MD “Father of Orthopedic Medicine”
- SLTT for soft tissue evaluation
- Manipulation, friction, traction, and injection
- “**physical therapists** were the most apt professionals to learn manipulative techniques”
- Textbook of Orthopaedic Medicine, Volume I

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Physical Therapists/Manual Therapy

- Freddy Kaltenborn
- Geoffrey Maitland
- Stanley Paris (AAOMPT founder, First OCS president)
 - All responsible for establishing Manual Therapy education programs for PT's in US.
- Evidence shows that manipulation and exercise are PTs most useful tools

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Safety

- <https://www.youtube.com/watch?v=CKhnnrBrRZw>

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Contraindications

- **RED FLAGS: Absolute Contraindications**
 - Vascular, bone, neuro, extreme pain, thunderclap HA, lack of diagnosis, no pt. consent
- **Yellow Flags: Is risk worth reward?**
 - Disc, Preganancy, RA, osteoporosis, spondylolysis/litheses, advanced DJD, spondy

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Complications Lumbar Spine

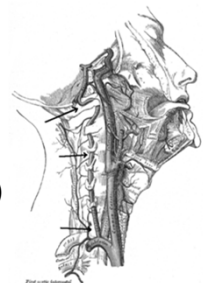
- Serious complications due to L spine manipulations are extremely rare. It is estimated at 1 per 3.7 million lumbar manipulations results in a worsened disk herniation or cauda equina syndrome (Oliphant 2004)
- In comparison, each year 16,500 people die in the US alone as a result of taking NSAIDs
 - Another 100,000 people require hospitalization as a result of taking NSAIDs (Cryer 2005)

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Cervical Artery Dysfunction

ERNST (2010)

- SR of case reports up to '09
- Aim of study summarize all cases in which chiropractic spinal manipulation was followed by death
- 26 fatalities published (1934-2002)
 - Dissection of VA following chiropractic neck manipulation



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Slide 16

SJT1 page 50 SMT 1 manual, yellow/Relative contraindications.

S. Jake Thompson, 12/9/2019

Cervical Artery Dysfunction

- Terret 2001
 - 256 Vascular accidents
 - 142 linked to chiropractic
- **Most linked to chiropractors secondary to prevalence of HVLAT treatment**

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Cervical Artery Dysfunction

- Murphy (2010)
 - Great controversy regarding cervical HVLAT as cause of VAD and Stroke
- Dvorak & Orellie (1985)
 - Retrospective survey to 367 members of Swiss Society for Manual Medicine: Recall how many cervical HVLAT performed and how many complications
 - Slight Neuro complications 1/40000
 - "Important complications" to be 1/400000

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Cervical Artery Dysfunction

- Lee et al (1995)
 - Retrospective survey of Ca. Neurologists
 - Recall over prev. 2 years how many "neurological complications following chiropractic adjustment" including VADs they had encountered.
 - 21% reported at least one case of stroke
- Klugart et al (1996)
 - 10 yr retrospective survey of Danish chiropractors incidence of CVA
 - 1/362 chiropractic years or 1/1.3 million cervical treatments

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Cervical Artery Dysfunction

- Rothwell et al (2001)
 - Ontario health data to compare 582 cases of VBA stroke to 2328 controls no hx of stroke
 - <45 y.o. 5x more likely than control to have visited a chiropractor within 1 week of VBA stroke

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Cervical Artery Dysfunction

- Smith et al (2003)
 - Case control study of 51 (25 VBA/26 CA) patients with CAD, Ischemic stroke, or TIA and 100 control patients suffering stroke not caused by dissection.
 - NO significant association of neck manipulation and ischemic stroke or TIA
 - Subgroup of 25 cases of VBA dissection 6x more likely to have seen chiropractor within 30 days than controls.

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Cervical Artery Dysfunction

- Cassidy et. al (2008)
 - 818 strokes hospitalized (54.2% vertebral occlusions, 41.2% basilar, 4.7% both)
 - <45 y.o. 3x more likely to see a chiropractor or PCP before stroke than controls.
 - One month prior to stroke and association between chiropractic care and VBA stroke
 - **STRONGER** association between PCP visits and subsequent VBA stroke

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Cervical Artery Dysfunction

Cassidy (08) cont.

- >45 years: NO increased association between chiropractic visits and VBA stroke.
- There was however, an association between VBA stroke and use of PCP
- Practitioner visits billed for HA and neck pain were highly associated with subsequent VBA stroke

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Cervical Artery Dysfunction

Cassidy (08) cont

- Conclusion:
 - “There is NO excess risk of VBA stroke from chiropractic care”
 - The increased risk of VBA stroke associated with chiropractic and PCP visits likely due to patient with **HA** and **neck pain** from VBA dissection already in progress.

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Cervical Artery Dysfunction

Cassidy et al (2017)

- Investigated associations between chiropractic exposures and carotid artery-related stroke and compare them to PCP exposures in the same analyses.
 - A total of 15,523 carotid artery stroke cases from 1993-2002
 - 214 <45 yo
 - 14 days preceding their strokes, 5,433 cases (35%) had received only PCP services, 186 cases (1.2%) had received only DC services, and 116 cases (.7%) had received both services

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Cervical Artery Dysfunction

• Cassidy et al (2017)

- Six cases less than 45 y.o. saw a chiropractor within 14 days of their strokes, compared to 70 cases who saw a PCP
- Associations increased when analyses were limited to service codes for **neck pain** and **headache-related diagnoses**
- Headache and neck pain are common presenting symptoms in patients with cervical artery dissection

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Cervical Artery Dysfunction

Cassidy et al (2017)

- Conclusion:
 - Study suggests that the association between chiropractic care and carotid artery stroke could be due to care being delivered for dissection-related neck pain and/or headache, prior to the ischemic event.
- All practitioners treating patients with neck pain and headache should be aware that it could occur.

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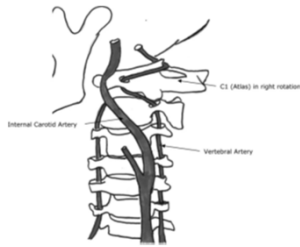
Cervical Artery Dysfunction

• Murphy (2010)

- Based on current evidence there is no strong foundation to claim a causal relationship between cervical HVLT and VADS.
- Ind. Experiencing a VAD seek care from chiro or other practitioner for relief of neck pain and headache secondary to pre-existing dissection.
- Progression from dissection to stroke occurs independent of HVLT
- Responsibility of practitioner is to identify patient who is having dissection so appropriate referral can be made.

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Hemodynamics



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Hemodynamics

- Dissection is characterized by separation of the inner layer (tunica intima) from the middle and outer layers of the arterial wall.
- Occlusion of one artery may not result in direct brain perfusion problems because of the bilateral supply to the brain
- In both dissection and non dissection events an embolus can result, leading to arterial blockage, resulting in a stroke

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Hemodynamics

- Moser (2019)
 - Measured cerebral blood flow, vertebral artery blood flow and velocity in patients undergoing neck manipulation for neck pain.
 - No significant change in blood flow in the posterior cerebrum or cerebellum in chronic neck pain participants after maximum head rotation and cervical manipulation
 - No clinically meaningful changes in the blood flow or velocity in the vertebral arteries before–after head positional change and spinal manipulation

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Hemodynamics

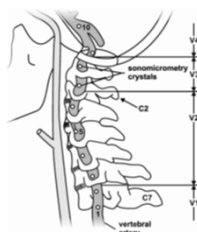
- Moser (2019)
 - Together with previous work our results support the position that the association between cervical manipulation and stroke is due to protopathic bias.

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Hemodynamics

Herzog (2012)

- The maximal strain values for the ROM testing at each segmental level were always greater than the corresponding strain values for the SMTs, suggesting that neck SMTs impose less stretch than turning your head, or extending your neck while looking up at the sky.



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Screening

- Vertebral artery test: Poor validity and reliability
 - Test actually stresses artery greater than treatment.
- Cranial Nerve and Eye exam
- Blood pressure
- Signs of ICA and VA
- PMH – Previous trauma and recent infection biggest risk factors (Thomas 2016)
- HTN bigger risk factor than High cholesterol or Overweight

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Screening

- **5 D's And 3 N's**: Diplopia, dizziness (vertigo, light-headedness, giddiness), drop attacks, dysarthria, dysphagia, ataxia of gait, nausea, numbness and nystagmus
- Pain
- These should be referred for further evaluation!!!

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Summary - safety

- Benefits outweigh the risks as long as clinical decision making is based on thorough examination and Evidence-based impairment-based approach
 - Screen for red flags
 - Consider contraindications
 - Modify techniques when appropriate
- More risk with other common medical and surgical interventions than manipulation
- Physical Therapists clinical decision-making philosophy facilitates safe practice

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SPINAL MANIPULATION

- College of physicians clinical guidelines (2017):
 - Acute LBP
 - Heat, Massage, **Acupuncture**, **spinal manipulation**
 - Chonic LBP
 - Ex, multidiscipline rehab, **Acupuncture**, mindfulness stress reduction, Laser, EMG biofeedback, operant therapy
 - Cognitive behavioral therapy and/or **Spinal Manipulation**

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Spinal Manipulation Cervical

- Cervical Spine CPR (Puentedura E et al 2012)
 - Symptom duration < 38 days
 - Expectation that manipulation will help
 - Difference in cervical rotation side to side >10 degrees
 - Pain with PA spring testing mid C spine
- If 3 out of 4 attributes present, the probability of experiencing a positive outcome improved to 90% Positive LR 13.5

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Spinal Manipulation Cervical



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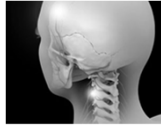
Spinal Manipulation Cervical

- Dunning 2012
 - HVLAT to c-spine and CT junction
- Cross 2011
 - T-spine HVLAT improves neck pain, ROM, and function
- Pudentura
 - Cervical HVLAT > Thoracic HVLAT both beneficial for pain and disability.

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Spinal Manipulation Cervical

- Cervicogenic Headaches and Dizziness
 - Evidence for SMT greater than that supporting medications, injections, and surgical procedures (Haldeman 2010)
- 6-8 sessions of HVLAT over 4 weeks to upper cervical and upper thoracic spine compared to mobilizations and exercise
 - Greater improvement in headache intensity and duration as well as medication useage (Dunning et al 2016)



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Spinal Manipulation Lumbar

•Who will Benefit?

- CPR's
 - Flynn CPR (2002) SMT for LBP
 - Symptoms >16 days (best predictor)
 - Fear avoidance beliefs <19
 - Lumbar hypomobility with spring test
 - >35 deg hip IR on one side
 - No symptoms distal to knee
- Used Chicago technique which is non specific
- 3/5 68% success, 4/5 45-95% success

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Spinal Manipulation Lumbar

- CPR cont
 - Flynn Cont.
 - 45% had success without any attempt at prediction
- Cleland (2006)
 - Used lumbar Roll with Flynn CPR n=12
 - 91.7% (11/12) had successful outcome in 2 visits on ODI score (mean reduction ODI was 57%)
 - Only 12 pateints, no control
 - Identify patients that will benefit from **any HVLAT**

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Spinal Manipulation Lumbar

•Haskins 2012

- Systematic review of CPR's for LBP
- The current body of evidence does not enable confident direct clinical application of any of the identified CPRs. Further validation studies utilizing appropriate research designs and rigorous methodology are required to determine the performance and generalizability of the derived CPRs to other patient populations, clinicians and clinical settings

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Spinal Manipulation Lumbar

- Fritz CPR
 - Used Flynn CPR and added PA mobility testing
- Categorized as Hypo or Hypermobility
 - Hypomobility 74% had successful outcome with HVLAT
 - Hyper 16.7% successful outcome with HVLAT

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Spinal Manipulation Lumbar

- A case control study by Fritz showed that patients receiving thrust manipulation had:
 - Fewer treatment sessions
 - Shorter length of stay
 - Lower cost in physical therapy than patients receiving non-thrust manipulation

Fritz JM, Brennan GP, Leaman H. Does the evidence for spinal manipulation translate into better outcomes in routine clinical care for patients with occupational low back pain? A case control study. Spine. Journal 2006

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MRI

- Lumbar multifidus cross sectional area:
 - Hides 1994, 1996
 - Kader 2000
 - Kjaar 2007
- Beattie 2014
 - Diffusion weighted image to generate Apparent Diffusion Coefficient map (used to determine diffusion rates post manual therapy treatments)

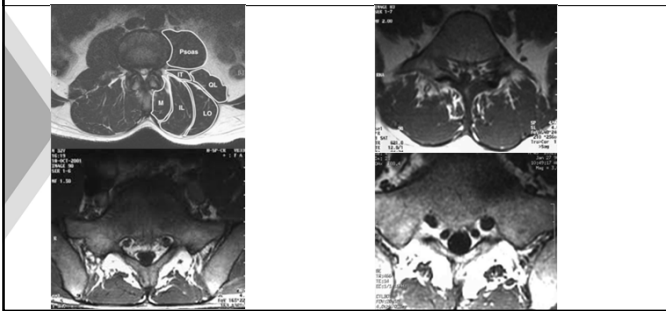
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Spinal Manipulation Lumbar

- Hides 1994
 - LM involvement in LBP
 - Measured LM Asymmetry in Acute and Subacute LBP
 - Marked asymmetry in MRI
 - 31% at level of symptoms/3% asymptomatic
 - One subject had **pain < 24 hours**
- LM inhibition likely due to pain/reflex inhibition

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Lumbar Multifidus Atrophy



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Spinal Manipulation

- Hides 1996
 - RCT 39 subjects with Acute first episode
 - 34 demonstrated 25% LM SA atrophy at L5
 - Randomly allocated to:
 - Non active Rx (standard medical)
 - LM specific ex
 - Measured pain, disability, ROM, and LM
 - 4 Weeks no difference in disability scores, all has returned to normal function
 - Control group MRI @4 wks 16.8% and @10 14% less

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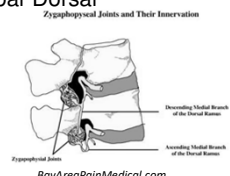
Spinal Manipulation

- Hides 1996 cont.
 - Exp group had complete restoration of LM
- @ 1 year follow up:
 - 30% of exp group had reoccurrence
 - 80% of control group had reoccurrence
- **Persistent inhibition could predispose to injury**
- Reflex inhibition likely cause due to results of CG

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Spinal Manipulation

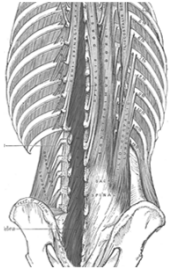
- Kader 2000
 - Multifidus atrophy present in 80% pts. with LBP
 - With or without leg pain
 - Wasting likely caused by "Lumbar Dorsal Rami syndrome"
 - Explains referred leg pain in absence of other MRI abnormalities.



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Spinal Manipulation

- Lumbar Multifidus
 - Completely covers facet jt. with exception of ventral surface.
 - LM is to facet joint is what quadricep is to knee.



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Spinal Manipulation

- Beatty 2014 (4th study with ADC)
 - Single group repeated measures
 - LBP greater than or equal to 2/10
 - “Hypomobile” at L5-S1
 - MRI DWI Before and after Side lying HVLAT
- 12/19 within session responders (pn reduced 2/10)
- Increased diffusion rate of IVD 3.1%-5.9 vs. No sign change or neg changes in Non Responders.

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Spinal Manipulation

- Mens 2000
 - RCT 44 women (Post partum pelvic pain) 3 groups
 - Form closure ex
 - Longitudinal ex
 - Gradually increase ADL, NO exercise
 - FORM CLOSURE no better than other 2 groups
 - 25% of Form closure group dropped out due to pain from ex.
- Does not support use of FORM closure ex.

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Spinal Manipulation

- Stuge 2004
 - RCT 81 (NPPPPP) 2 groups
 - Force closure
 - Gen ex
 - 11 Supervised sessions over 20 weeks
 - 1 yr follow up
 - 85% minimal disability in Force closure
 - 47% in control group (gen ex)
 - Spinal Manipulation performed in both groups PRN.

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Spinal Manipulation

Hides (1994, 1996)

LM involvement in LBP

Measured LM Asymmetry in Acute and Subacute LBP

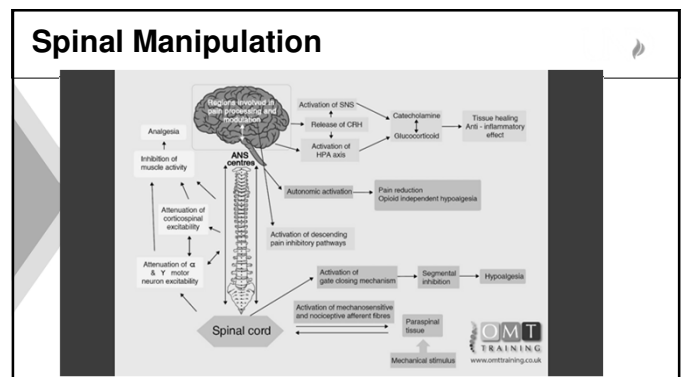
Marked asymmetry in cross sectional area in MRI

31% at level of symptoms/3% asymptomatic

One subject had **pain < 24 hours**

LM inhibition likely due to pain/reflex inhibition

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Spinal Manipulation

▶

Lumbar Facet joint involvement in Myofascial Trigger Point (Trp)

- Muscle spindle
 - Alpha motor neurons
 - Acute trigger point
- Gamma motor neurons
 - Sub Acute
- Beta motor neurons
 - Chronic

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Spinal Manipulation

▶

- Treatment of both Trp and Joint dysfunction is important when both are present. (Lewitt 1991)
- Manipulate joint
- Change input at mm spindle/reflexive change
- Allow pt. to move with less/no pain and return to ADL

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