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Lecture #102: OMM: Lab 11 Prep Lecture Lumbar Diagnosis, Lumbar Soft Tissue

Foundations Course

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Do.
Make.
Heal.
Innovate.
Reinvent the Future.

Session Objectives

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1. Identify spinal landmarks in order to localize & differentiate vertebral segments T12 through S1.
2. Evaluate neuromusculoskeletal-connective tissue TART changes & diagnose Type 1 & 2 dysfunctions of the lumbar spine.
3. Practice documentation of the biomechanical diagnoses of Type 1 & 2 lumbar spinal dysfunctions in the physical exam ("O" in SOAP note format) for professional communication.
4. Identify, evaluate, and understand the physiology of the muscles & tendons of the back, abdomen & buttocks, & hip flexors & extensors.
5. Understand the importance of an osteopathic examination of dysfunctions, muscle tone & function in the clinical assessment of back pain
6. Assess for contraindications to soft tissue techniques and demonstrate the traction, prone pressure with counter-leverage, and supine extension soft tissue techniques for the lumbar region.

Physical Examination (PE): Look at the Lumbar Spine Region

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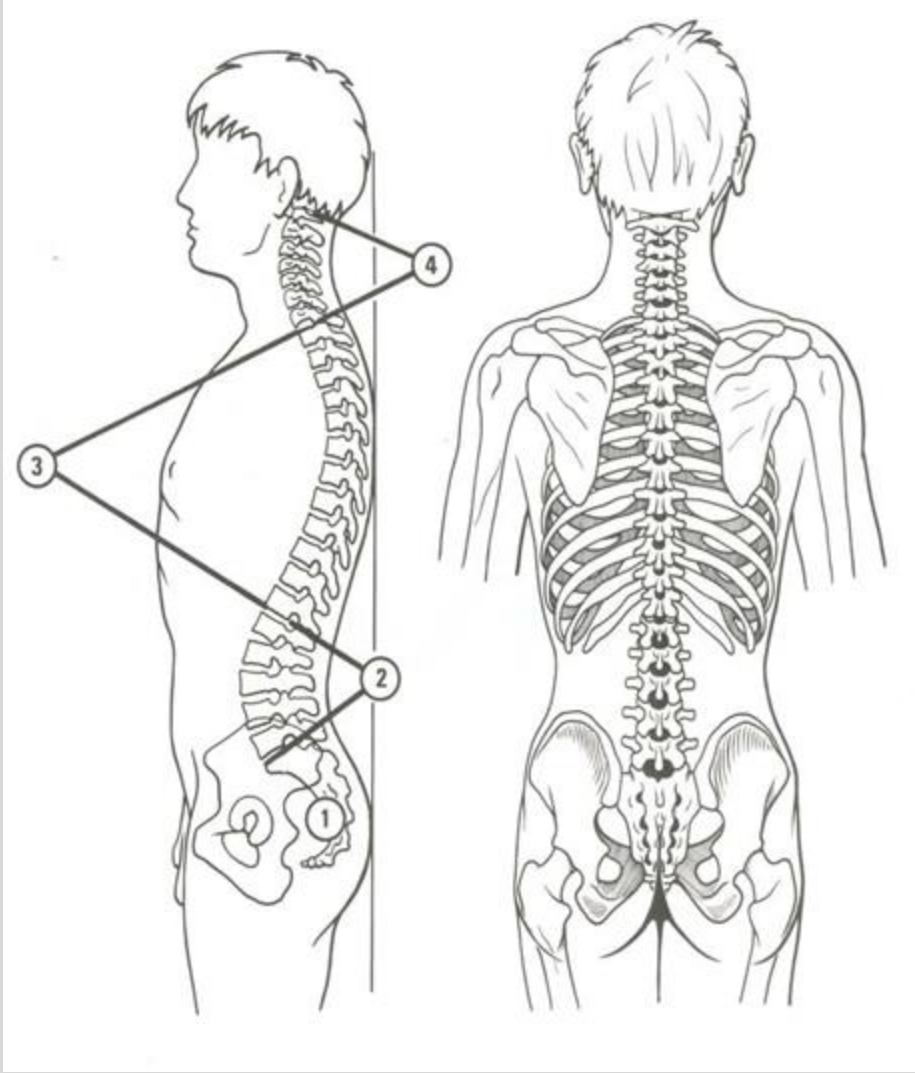
- Lumbar Spine Primary **lordotic** Curve
  Backward Bending

- Thoraco-Lumbar Junction: T10-T12 Lordotic



Look at the Lumbar Spine Region:

1. Visually determine if the anatomical landmarks are level relative to the
a. horizontal (transverse),
b. sagittal, and
c. coronal (frontal) planes.

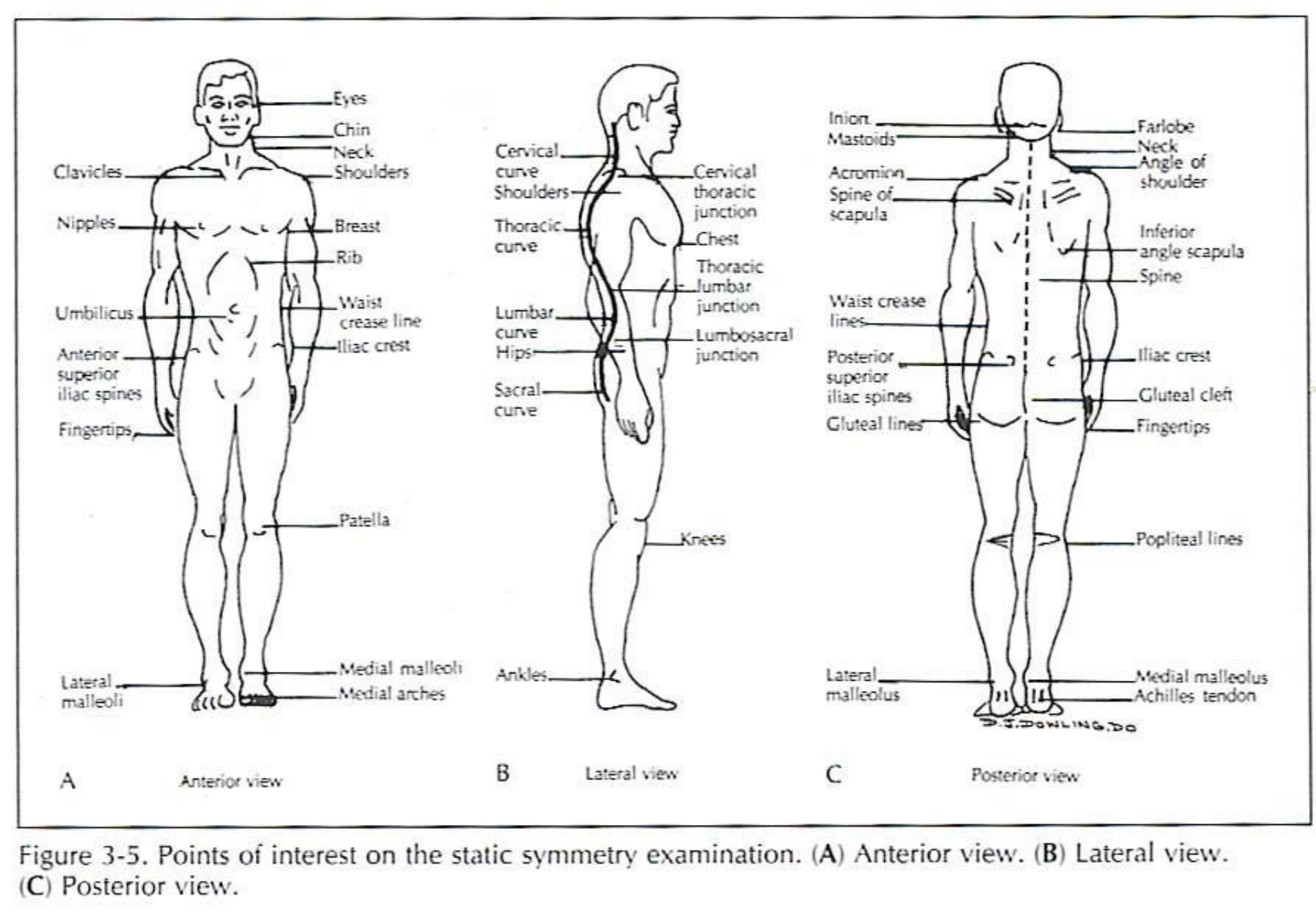
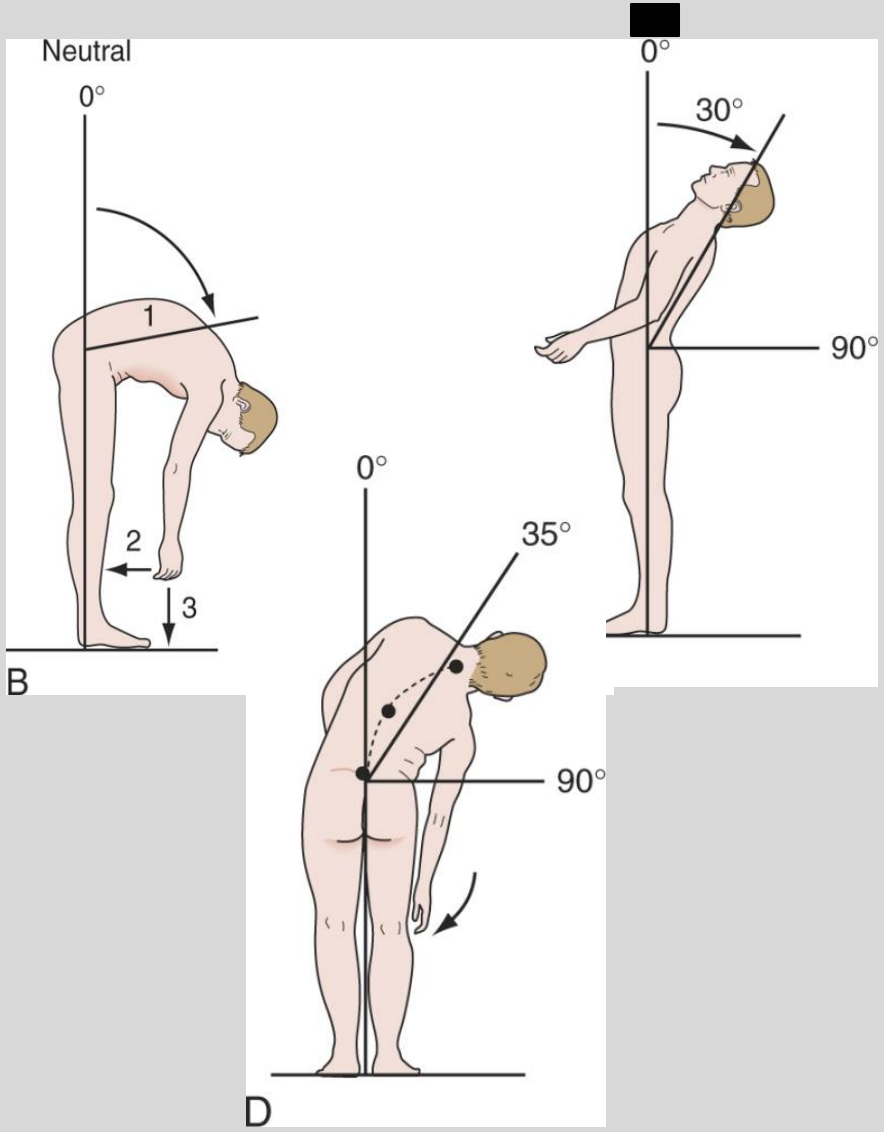


Figure 3-5. Points of interest on the static symmetry examination. (**A**) Anterior view. (**B**) Lateral view. (**C**) Posterior view.

PE: Move - Gross Thoraco-Lumbar Range of Motion (ROM) evaluation

- **Approximate healthy Range of Movement:**
- **Thoracolumbar Spine** (approximate degrees of motion)
- Flexion 0-80 degrees
- Extension 0-30 degrees
- Lateral bend 0-35 degrees
- Rotation 0-45 degrees

From Carr AJ, Harnden A: Orthopedics in Primary Care. Oxford, Butterworth-Heinemann, 1997, p 72.



Osteopathic Lumbar Diagnosis of Somatic Dysfunctions

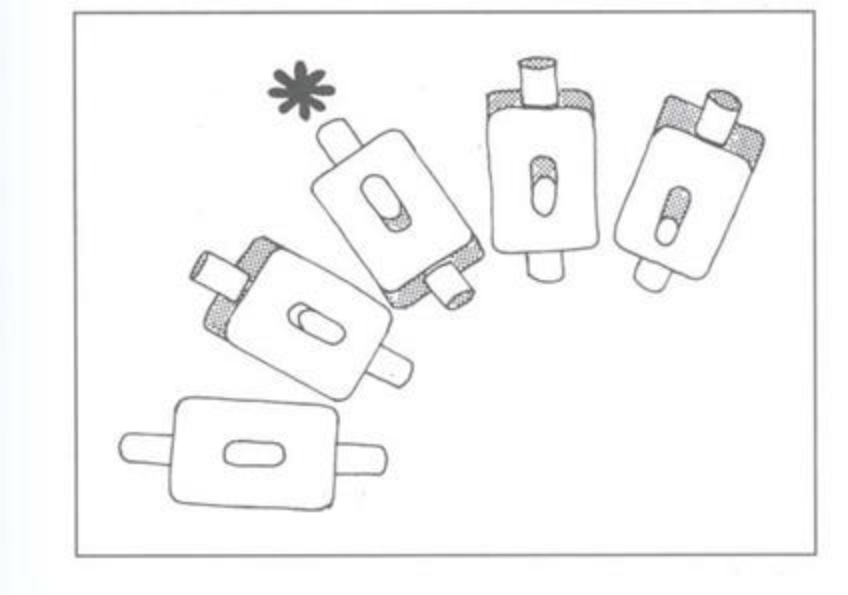
Characteristics of Vertebral Segmental Dysfunction and Adaptation

	Non-Neutral Segmental Dysfunctions	
	Flexed Position	***Extended Position***
Positional names ("-ed" endings)	**FRS L**eft **F**lexed, **R**otated, **S**idebent **L**eft	**ERS L**eft **E**xtended, **R**otated, **S**idebent **L**eft
Restricted motions ("-ing" endings)	**SRE R**ight **S**idebending,**R**otation, **E**xtension	**SRF R**ight **S**idebending,**R**otation, **F**lexion
Lesion type	Type II (non-neutral)	Type II (non-neutral)
Number	Single	Single
Cause (etiology)	Trauma	Trauma
Facet motion impairment	Right extension	Left flexion
Effect of hyperextension	Worse	Re-establishes symmetry
Effect of hyperflexion	Re-establishes symmetry	Worse
Coupled rotation – sidebending	Same side (e.g.,Lt,Lt)	Same side (e.g.,Lt,Lt)
Observed posterior transverse process(es)	Left	Left

Mitchell, Jr., FL and Mitchell, PKG, The Muscle Energy Manual: Evaluation and Treatment of the Thoracic Spine, Lumbar Spine, & Rib Cage, Volume Two, Second Edition, MET Press, East Lansing, Michigan, 2002, *Chapter 3, Biomechanics of Segmental Motion Restriction.*

Osteopathic Lumbar Diagnosis: Fryette's 2nd Principle

When side bending is introduced into a non-neutral spine, the bodies of the vertebrae will rotate toward the side of concavity



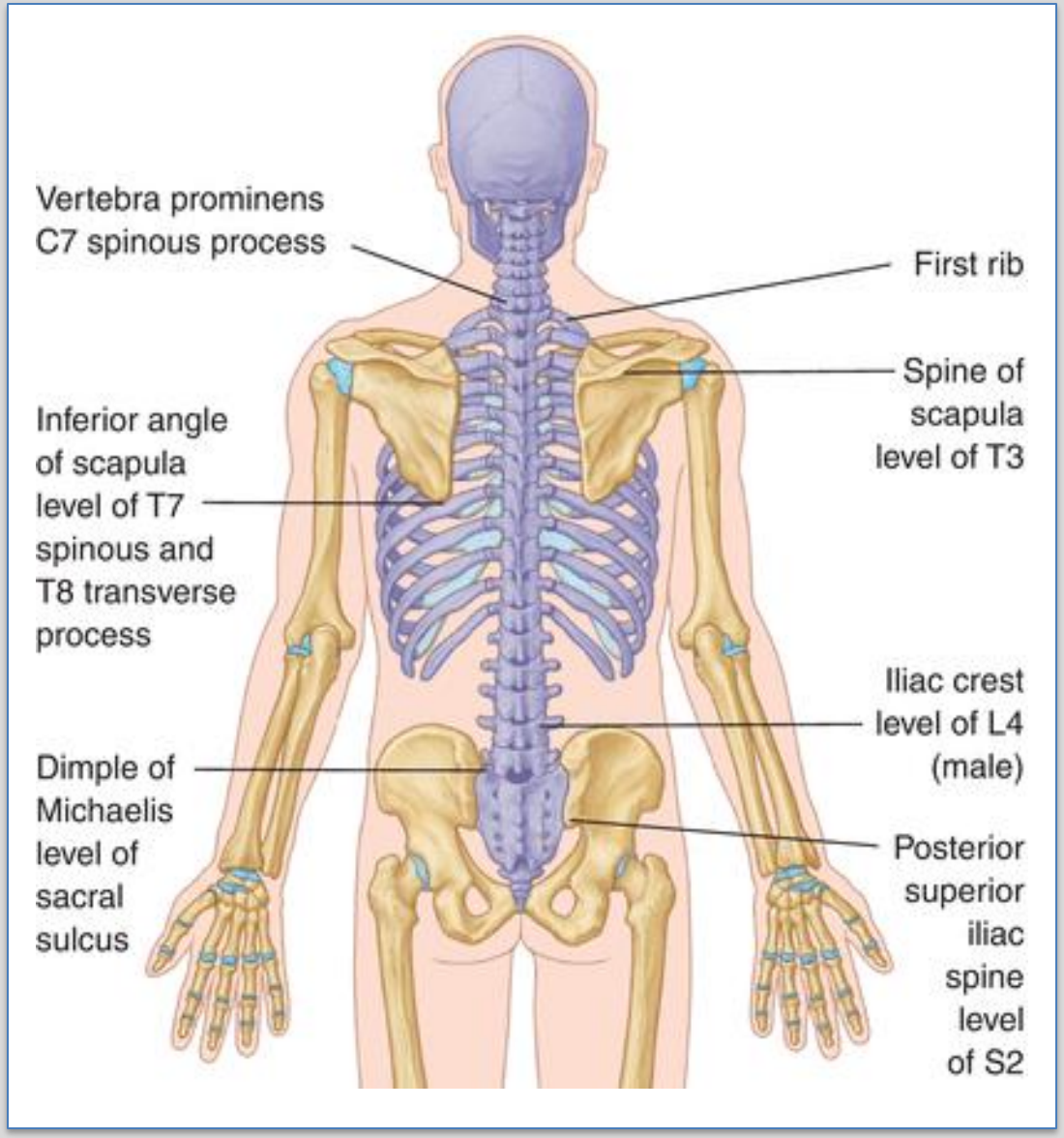
Type II dysfunction

- Occur as a result of trauma/abrupt twisting
- Maintained by short restrictors – (rotatores brevis and intertransversari muscles)
- Found at apex or extremes of Type I curves

Should be treated before Type I lesions

Lumbar Dysfunction Diagnosis

- Use anatomical landmarks to identify lumbar spine region.
- Use a screening approach to identify which segment you want to focus on diagnosing.
- Use landmarks figure out at which level (L1, L2, L3, L4, or L5) you palpate a somatic dysfunction
- Find the most posterior transverse process in the area.



Pg. 7 Nicholas Atlas 3rd ed
https://nyit.idm.oclc.org/login?url=https://meded.lwwhealthlibrary.com/content.aspx?sectionid=123844130&bookid=1629

Boney Landmarks

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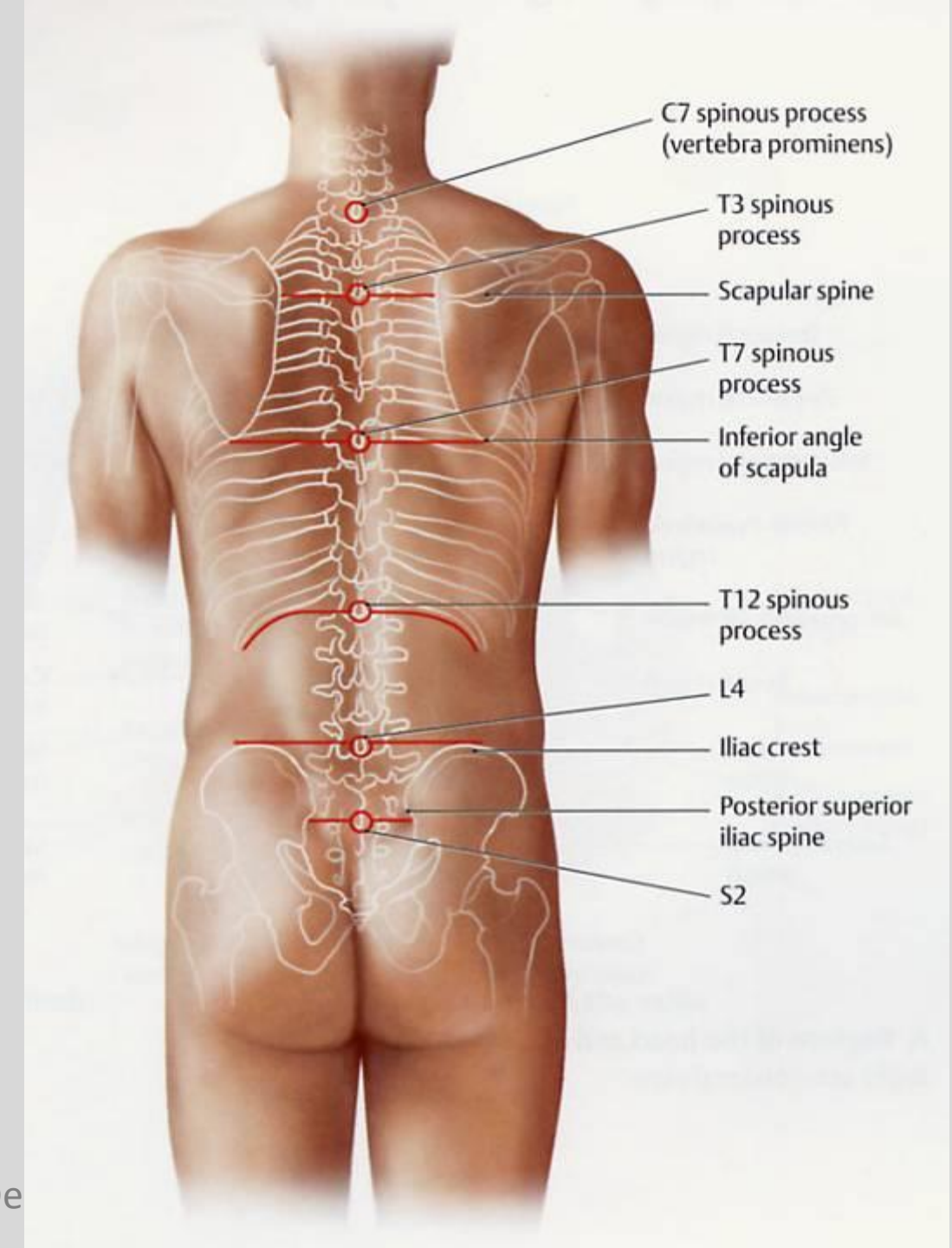

- 12th rib attaches to T12
- Find the T12 spinous process
- L1 spinous process is just inferior
- Count spinous processes going inferiorly
- Iliac crest heights at L4 or **between** L4-L5
- PSIS at the level of S2

Screen for Osteopathic Diagnostic Criteria for Somatic Dysfunctions

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- T.A.R.T.
  - Tissue Texture Change
  - Asymmetry
  - Restriction of Motion
  - Tenderness or Subjective complaint of pain

PE: **Feel / Palpate** the lumbar region

- Check soft tissue for texture changes
- Areas of hyper/hypo-tonicity?
- Areas of tenderness?
- Color changes (sympathetic chain ganglia extend inferiorly to L2)
- Palpate bony landmarks

PE: Palpate Lumbar spine transverse processes (TP)

- Lumbar spine Transverse processes are about 1.5 inches lateral from midline (spinous processes).
- Rotational segmental motion examination
- With Patient prone, physician places thumbs or fingers on TPs of segment to be tested.
- Apply a firm pressure **towards anterior of Patient's body**, (toward the table) *one side at a time*; Which TP does not move into rotation easily?
- (The side that resists your downward/ anterior pressure = the side of the posterior TP = the direction of that vertebra's rotation dysfunction. Named/ documented for which direction the anterior vertebral body is rotated)

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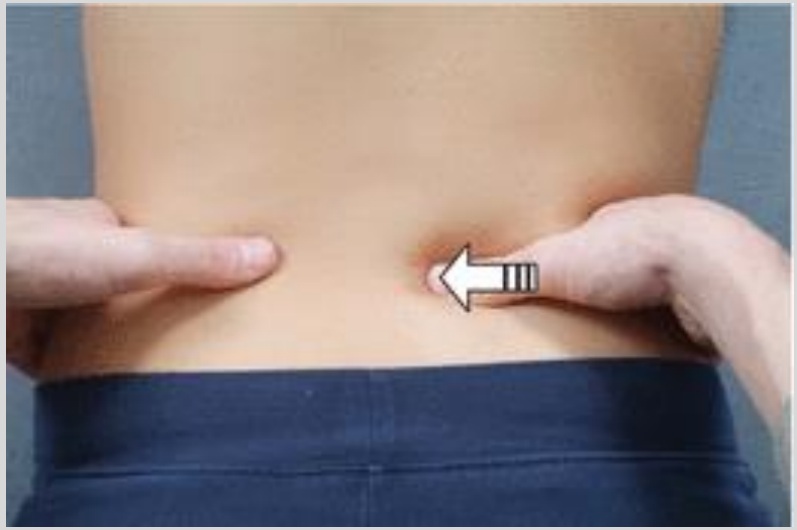
ARROW: Inducing right sidebending

Left rotation by pushing **anteriorly** on right transverse process (TP)



ARROW: Inducing right sidebending

Left rotation by pushing **anteriorly** on right TP

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Vertebral Unit

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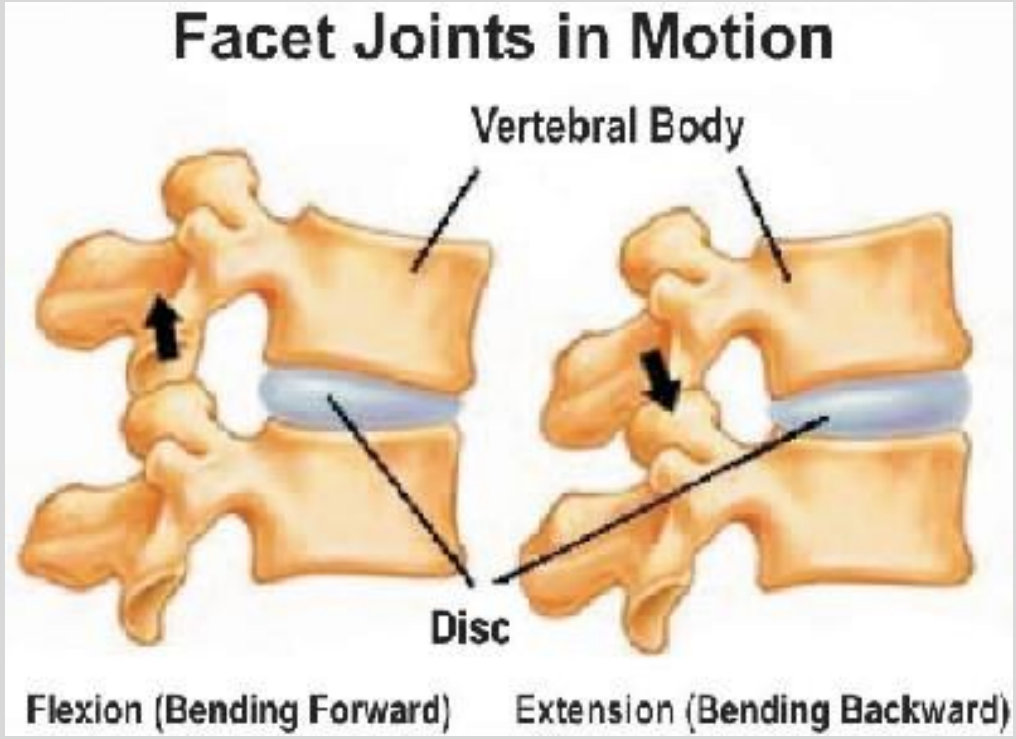
Facet joints have 2 surfaces that are Motion Guiding Structures, among Anterior & Posterior Elements



- Planes of coupled motions
  - Flexion & Extension = Sagittal Plane
  - Rotation = Horizontal Plane
  - Side bending = Coronal Plane

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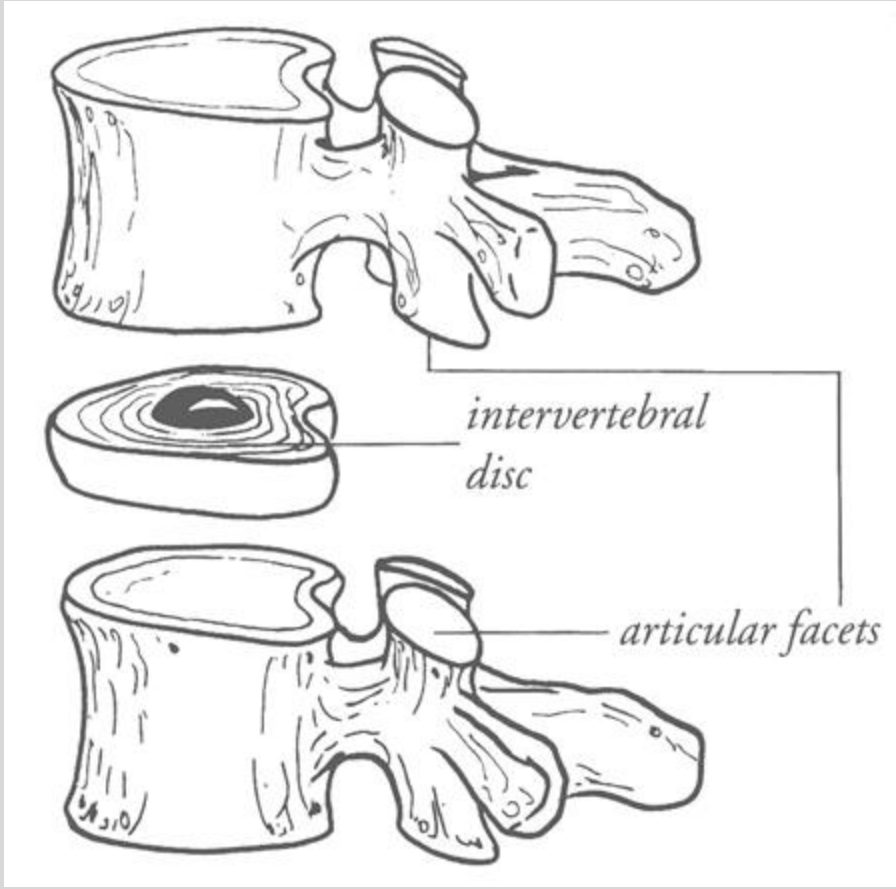
Vertebral Unit

Anterior Portion

Weight Bearing (Vertebral bodies and Discs)

Posterior Portion

- Neural Structures (Cord & nerve roots)
- Points of Articulation (Facets & Transverse Processes)
- **Motion Guiding Structures (Facets): allow for motion in only specific directions.**
- **Ligaments, tendons, and other connective tissues limit the range of the motion**



Type II Dysfunctions

- **Extended dysfunctions (ERS)** "disappear" in extension and are accentuated in flexion. In extreme flexion when both posterior facets should open, one remains closed and the vertebra rotates and sidebends to **that** side.

- **Flexed dysfunctions (FRS)** "disappear" in flexion and are accentuated in extension. In extreme extension when both posterior facets should close, one remains open and the vertebra rotates and sidebends to the **opposite** side.

Testing segment for Extension

- Have pt prop themselves up on their elbows ("SPHINX" or "TV WATCHING" to create extension to the segment being tested.

- Motion test segment ONE SIDE AT A TIME to see if *asymmetry improved*.

Testing segment for Flexion

- Have patient bend forward on knees to flex lumbar vertebra

("CHILD'S POSE").

- Again, motion test segment ONE SIDE AT A TIME as previously described to see if asymmetry improved.

Palpate for symmetrical ease of rotation in extension

“Play lay face-down. Would you prop yourself up on your elbows like you’re watching TV?”

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Type 2 Somatic dysfunction

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- If a single segment (e.g. L3) is found to be restricted in motion, the **transverse process** that is **more posterior** (e.g. the right) is the **same side** that the segment would **rotate (R) more freely towards**.
- If on testing the posterior segment becomes **more symmetrical** in flexion (F) or extension (E), then it is named for this **"direction of ease" (i.e. segment became less posterior** in flexion).
- Using Fryette's laws, this somatic dysfunction is a Type II spinal segment dysfunction, and
  - assume that side bending and rotation is coupled to the same side
- Our somatic dysfunction (SD) is L3 Flexed, Rotated and Sidebent to the right on L4
  - (name the dysfunction for how it moves on L4), or L3 FRS Right, or L3 F RrSr.

Shorthand Abbreviations & Documentation of Segmental Dysfunctions for Physical Exam

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Abbreviations

- N—Neutral
- F—Flexed
- E—Extended
- L—Left
- R—Rotated
- R—Right
- S—Sidebent

Notations

- Type I dysfunction:
  - L5 neutral, rotated left, sidebent right
  - Or L5 NR_LS_R
  - Or L5 R_LS_R
- Type II dysfunction:
  - L5 flexed, rotated right, sidebent right
  - Or L5 FR_RS_R
  - Or L5 FRSR

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Motion Testing	Diagnosis	Motion Restriction	Positional Description	Facet Problem
Transverse processes are: Symmetric when extended Asymmetric when flexed Left TrProc prominent	ERS-left	Flexion restriction Side-bending right Rotation right	Vertebra is extended Side-bent left Rotated left	Left facet does not open
Transverse processes are: Symmetric when extended Asymmetric when flexed Right TrProc prominent	ERS-right	Flexion restriction Side-bending left Rotation left	Vertebra is extended Side-bent right Rotated right	Right facet does not open
Transverse processes are: Symmetric when flexed Asymmetric when extended Left TrProc prominent	FRS-left	Extension restriction Side-bending right Rotation right	Vertebra is flexed Side-bent left Rotated left	Right facet does not close
Transverse processes are: Symmetric when flexed Asymmetric when extended Left TrProc prominent	FRS-right	Extension restriction Side-bending left Rotation left	Vertebra is flexed Side-bent right Rotated right	Left facet does not close

Right

ERS = vertebra that is extended, rotated, side-bent (a positional description); FRS = vertebra that is flexed, rotated, side-bent (a positional description); TrProc = transverse processes; symmetric/asymmetric is in reference to the frontal plane (i.e., parallel to the frontal plane)

Fryette's 1st Principle

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- When side bending is introduced into a neutral spine, the bodies of the vertebra will rotate towards the side of convexity. This is an example of coupled motion in the vertebral unit.

Type 1 Dysfunction:

- group curves.
- neutral segments (no changes in rotation or sidebending during forward or backward bending; a.k.a. flexion or extension).
- rotation and side bending are to opposite sides.
- Formed gradually, usually as compensation.
- Maintained by long paraspinal restrictor muscles – erector spinae.

- Type I group curves can either be a dysfunctional curve, or a normal adaptation to some other asymmetry or lesion in another region. (As in scoliosis due to unequal leg length).

Type 1 Somatic dysfunction Documentation

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- On examination you find that the transverse processes of vertebral segments from L1 to L4 are posterior on the Left. As you motion test in flexion and extension there is no change to the posterior transverse processes.

- Your diagnosis would be notated as L1-L4 Neutral Side bent Right and Rotated Left

- Properly documented as L1-L4 N Sr Rl

Neutral Dysfunctions

- e.g. L1-L4 N S right R left
  Neutral, Side bent ***Right***, Rotated ***Left***
- Group Dysfunction (***three or more*** segments)
- May include thoracic spine segments
- Three or More Segments Have the Same Pattern
  - Such as Side bent Right and Rotated Left
  - Can involve Many Segments
- May be an adaptation

N Sr Rl

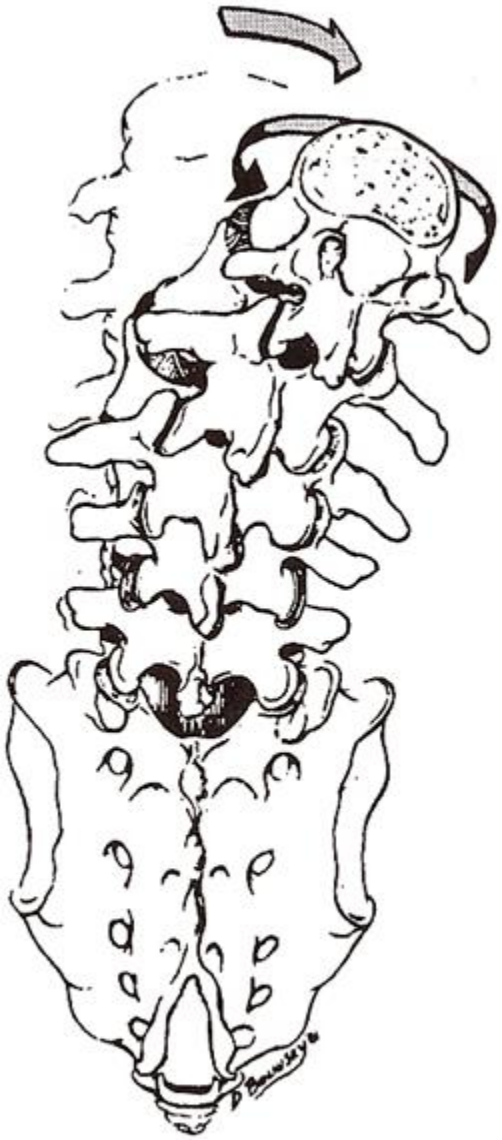

FIGURE 19. Physiologic motion of the spine (type I). Side-bending and rotation from neutral.

Biomechanics & Fryette's 3rd Principle

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Motion of a vertebra in any one plane of motion will influence motion of that same vertebra in any other plane of motion.

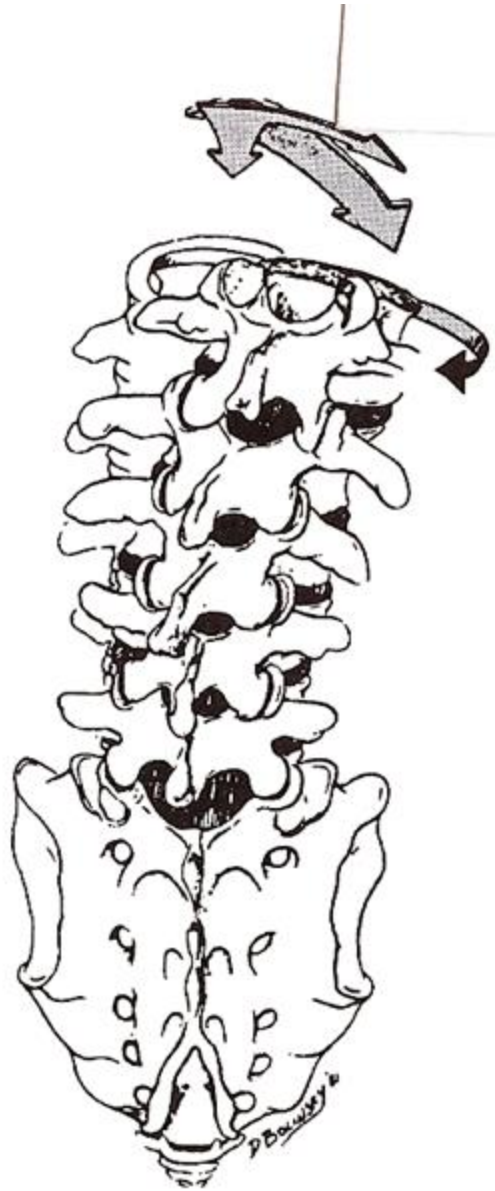
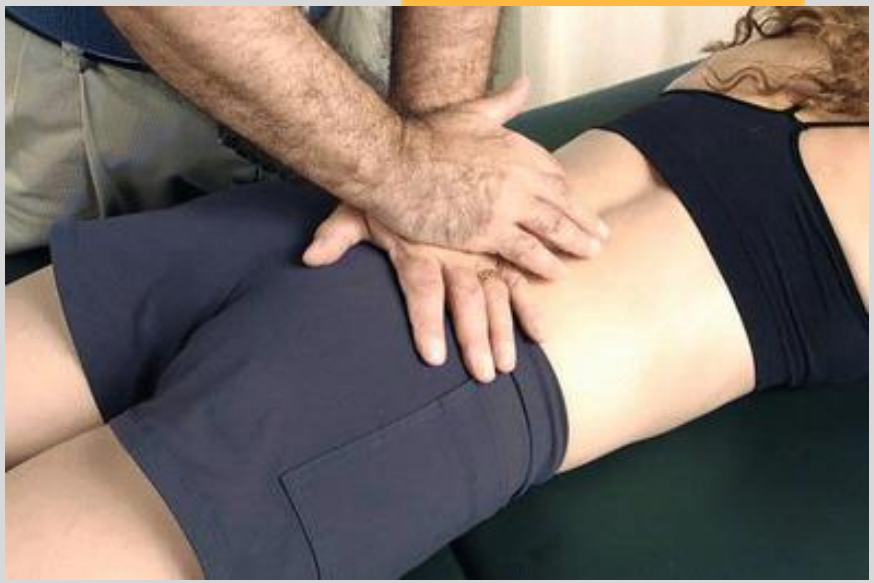


FIGURE 20. Physiologic motion of the spine (type II). Forward-bending and side-bending from a nonneutral position.

Lumbosacral Spring Test



- Patient lies prone on examination table.
- Physician stands to the side with the
  - dominant eye over the midline.
- Physician places the palm of 1 hand over the
  - midline of the lumbar region, with the thenar eminence of the hand over the lumbosacral junction (L5 & base of sacrum). The fingers extend superiorly over the spinous processes & paravertebral tissue.
- Physician provides a short quick push in an anterior direction with the heel of the hand and evaluates for compliance ("springiness") or resistance of the lumbar spine.
  1. Compliance of the lumbar spine with no resistance is described as a **negative test**.
  2. Resistance (stiffness) to this springing motion is described as a **positive test**.

Link: The **Lumbosacral Spring Test** (Fig. 27.48) 27 Osteopathic Segmental Examination. Foundations of Osteopathic Medicine: Philosophy, Science, Clinical Applications, and Research, 4e, 2018

Seated Motion Examination (examine patient in 2 positions. Seated involves examination with spinal weight-bearing.)

1. While standing beside/behind patient, physician contacts the segment with the most posterior TP by placing the thumb & index finger on the lateral aspects of the patient's TP's
2. The other hand on the shoulder to induce motion of spine.
3. If the TPs are most symmetrical with the patient in extension, then the vertebra is described as extended, sidebent, and rotated to the same side, for example, L1 ER_RS_R.
4. If the TPs are most symmetrical with the patient in flexion, then the vertebra is described as flexed and will be sidebent and rotated to the same side, for example, L1 FR_RS_R.
5. If the TPs are most symmetrical with the patient in the neutral position, then the vertebra is described as neutral and will be sidebent and rotated to opposite sides, for example, L1-L3 NR_RS_L. This result also indicates that there is a group dysfunction present, and all vertebrae in this region where TART changes were found would be described in the same fashion. This may include the thoracic spine, for example, T11–L2 NR_RS_L. L2 would be the apex of a L1-L3 NR_RS_L. Whereas, L1 would be the apex of a T11-L2 group curve, since it demonstrated the most posterior transverse process or the greatest amount of restricted motion within this group of vertebrae.

27: Osteopathic Segmental Examination
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Nomenclature - named for the easy direction (rather than the restricted direction)

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Abbreviations are by Convention, specifying the Segment and then the Flexion/Extension, then

- For Type II Dysfunctions, Rotation and Side bending (L5 F RS_L) <i.e. F R_LS_L>
  - If ***R is written before S***, Rotation and Side bending are understood to be to the **same** side
- For Type I Dysfunctions, Side bending and then Rotation (L1-4 N S_LR_R) <i.e. N S_LR_R>
  - If ***S is written before R***, Rotation and Side bending are understood to be to the **opposite** sides (with the rotation specified by the last subscript)

Goals of Soft Tissue Techniques

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- Relax muscles and fascia
- Improve circulation to muscles:
  - Arterial: O2 and nutrition to areas of ischemia. D.O. stands for Deliver Oxygen.
  - Venous
  - Lymph drainage
  - " We suffer from two things: the want of supply and a burden of dead deposits" -Andrew Taylor Still.
- Improve mobility
- Decrease pain
- Interfere with progression to chronicity
- To relax the ***stretch reflex***
  Which is based on ***mu. spindle mechanism***

Nicholas & Nicholas:

https://nyit.idm.oclc.org/login?url=https://meded.lwwhealthlibrary.com/content.aspx?sectionid=123844137&bookid=1629#123844867

Contraindications to Soft Tissue

Absolute and relative contraindication include but are not limited to the following:
There are no absolute contraindications.
Cautions and relative contraindications for local application:

A. Fractures
B. Open wounds
C. Soft tissue or bony infections
D. Abscesses
E. DVT
F. Coagulopathy
G. Neoplasm
H. Directly over the site of recent operation

Pg. 108 ECOP, A teaching guide for OMM 2nd ed

Soft Tissue Techniques of this lab

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Techniques of this OMM lab:

07.23: Prone Traction; Two-Handed, Lumbosacral Method
https://nyit.idm.oclc.org/login?url=https://osteopathicmedicine.lwwhealthlibrary.com/multimediaPlayer.aspx?multimediaid=13853197

07.26: Prone Pressure with Counterleverage
https://nyit.idm.oclc.org/login?url=https://osteopathicmedicine.lwwhealthlibrary.com/multimediaPlayer.aspx?multimediaid=13853203

07.28: Supine Extension
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Soft Tissue (ST) Prone Traction

07.23: Prone Traction; Two-Handed, Lumbosacral Method

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1. Identify lumbar paraspinal muscles and palpate for soft tissue tone.

ST method:

07.26: Prone Pressure with Counterleverage

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1.

ST method:

07.28: Supine Extension

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1.

Key Points Summary Slide

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- Visually & manually identify anatomical landmarks to localize & differentiate vertebral segments T12 to S1.
- Evaluation of neuromusculoskeletal-connective tissue TART changes & diagnosis of Type 1 & 2 dysfunctions of the lumbar spine.
- Practice documentation of the biomechanical diagnoses of Type 1 & 2 lumbar spinal dysfunctions in the physical exam ("O" in SOAP note format) for professional communication.
- Identify, evaluate, and understand the physiology of the muscles & tendons of the back, abdomen & buttocks, & hip flexors & extensors.
- Understand the importance of an osteopathic examination of dysfunctions, muscle tone & function in the clinical assessment of back pain
- Assess for contraindications to soft tissue techniques, and demonstrate the soft tissue techniques for the lumbar region:
  - prone traction,
  - prone pressure with counter-leverage, and
  - supine extension

General References

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DiGiovanna, EL, Amen, CJ, and Burns, DK, An Osteopathic Approach to Diagnosis and Treatment, Fourth edition, Wolters Kluwer, 2021, *Chapter 35, Thoracic Spine Anatomic Considerations, by Jonathan F. Fenton and Donald E. Phykitt*,

LINK: https://nyit.idm.oclc.org/login?url=https://osteopathicmedicine.lwwhealthlibrary.com/content.aspx?sectionid=248812916&bookid=2969

DiStefano, LA, Greenman's Principles of Manual Medicine, Fifth Edition, Wolters Kluwer, 2017, *Chapter 5, Normal Vertebral Motion, LINK to Sections:*

Section on "Coupled Movements," *including Neutral Mechanics, Nonneutral mechanics and Type III Mechanics*,

LINK: https://nyit.idm.oclc.org/login?url=https://osteopathicmedicine.lwwhealthlibrary.com/content.aspx?sectionid=116098355&bookid=1743#116098374

Section on "Vertebral Anatomy" *(read the 2 Introductory paragraphs, and then **skip down** to the **Thoracic Vertebrae** Section, including the Rule of 3s, **stop** just before the "Coupling mechanics" paragraph about the ribs – **SKIP** the Cervical Region, the Ribs, the Lumbar Vertebrae, and the Sacrum)* sections,

LINK: https://nyit.idm.oclc.org/login?url=https://osteopathicmedicine.lwwhealthlibrary.com/content.aspx?sectionid=116098355&bookid=1743#116098393

Mitchell, Jr., FL and Mitchell, PKG, The Muscle Energy Manual: Evaluation and Treatment of the Thoracic Spine, Lumbar Spine, & Rib Cage, Volume Two, Second Edition, MET Press, East Lansing, Michigan, 2002, *Chapter 3, Biomechanics of Segmental Motion Restriction.*

Seffinger, Michael A., D.O., executive editor, **Foundations** of Osteopathic Medicine, Philosophy, Science, Clinical Applications, and Research, **Fourth Edition,** Wolters Kluwer, 2018, *Chapter 27, Osteopathic Segmental Examination, by Walter C. Ehrenfeuchter, Raymond J. Hruby,*

LINK: https://nyit.idm.oclc.org/login?url=https://osteopathicmedicine.lwwhealthlibrary.com/content.aspx?sectionid=209545625&bookid=2582

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