

# Scoliosis

Brief on Scoliosis and Pilates applications

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# Scoliosis: Outline

- Definition
- Client complaints and presentation
- Contraindications
- Primary focus (ie length, stretch, stability)
- How to reduce sxs
- Ex. Progressions/ sequencing (general)
- Exercises to improve outcomes
- Research

# Scoliosis Definition:

- Two types of Scoliosis:
- Idiopathic Scoliosis:
  - curvature that begins in the spine for no known reason
  - Causes mal-formation of the vertebrae which creates a curvature of the spine.
  - Accounts for 75% of scoliosis cases
  - Females to males 3:1.
- Adolescent Idiopathic scoliosis:
  - ages 10 and up
  - onset just before puberty
  - progressive during the growth cycle throughout puberty
  - 3-7 years old is juvenile scoliosis
  - 0-3 infantile scoliosis

# Scoliosis Definition:

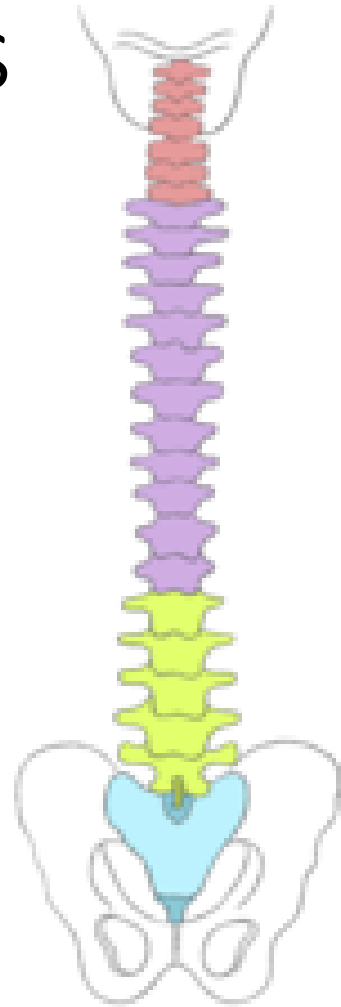
- Non-idiopathic scoliosis
  - Can be due to:
    - Tumors
    - Birth defects
    - Diseases
    - Post surgical
  - Adult onset degenerative scoliosis
    - Due to DDD, DJD, spondylolysis, spinal compression over time

# Scoliosis Definition:

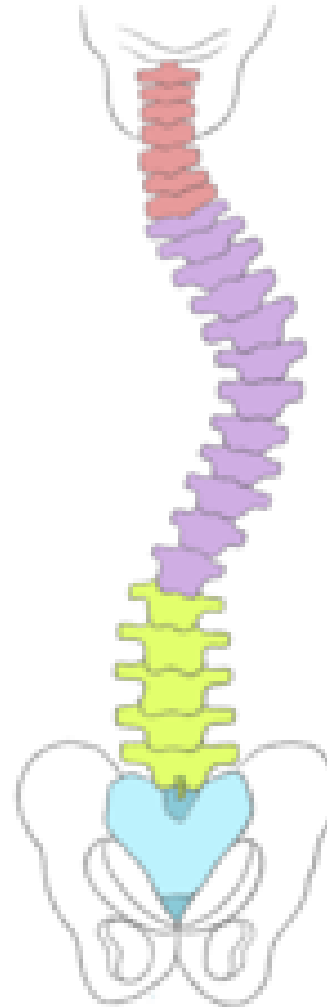
- Non- structural Scoliosis
  - Muscular imbalance
  - Postural stress causing alignment changes
  - Leg length difference
  - Pelvic asymmetry

# Scoliosis Definition: Types of Curves

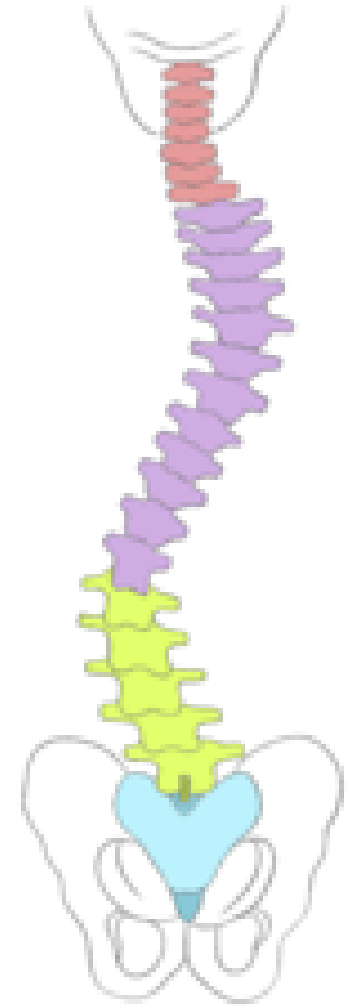
- C- Curve
- S-Curve



Normal Spine



C-Shaped  
Scoliosis



S-Shaped  
Scoliosis

# Scoliosis Definition: Types of Curves

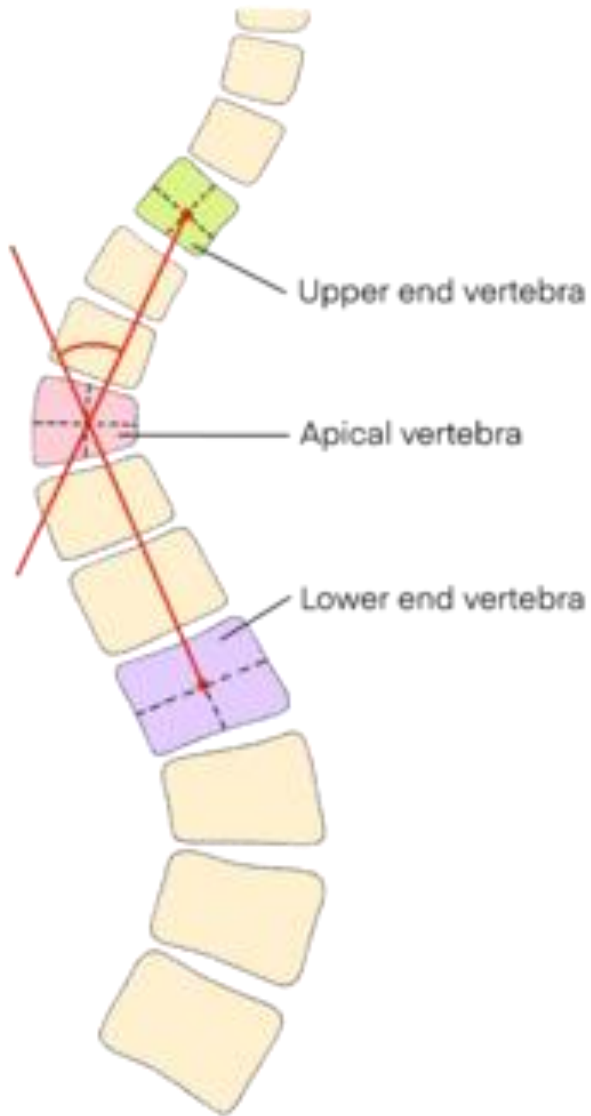
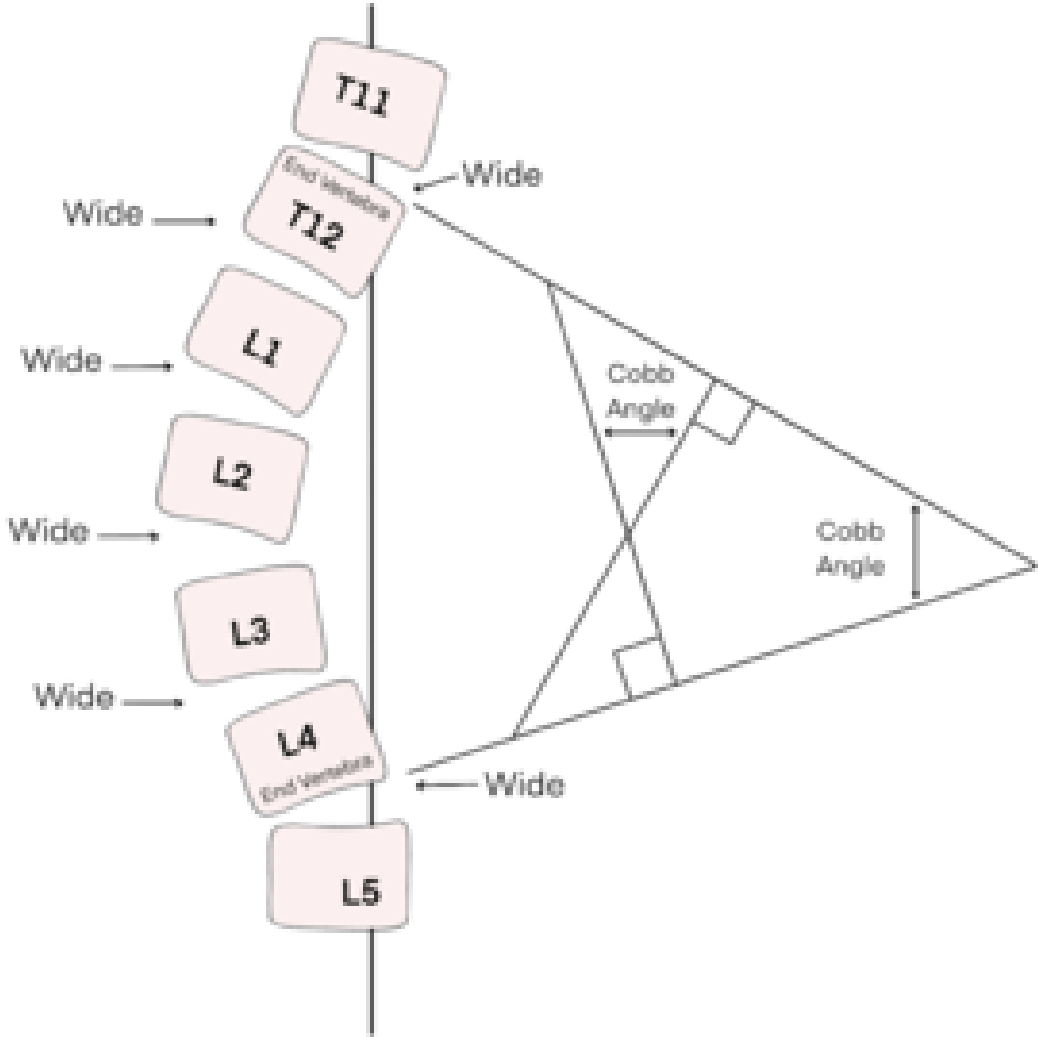
**C- Curve**



**S-Curve**



# Scoliosis Definition: Understanding the Curve





# Scoliosis Definition:

Types of Curves named for the convexity:

**C- Curve- Right Thoraco-lumbar curve**



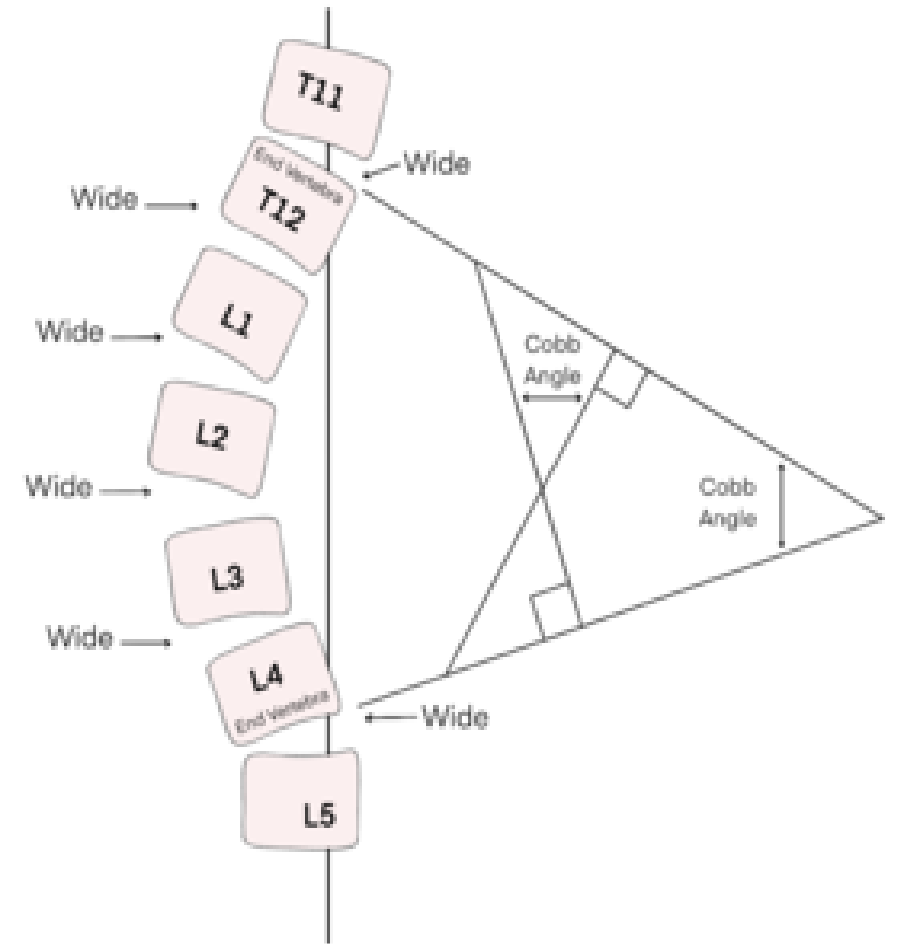
**S-Curve: L thoracic, R lumbar curve**



# Scoliosis Definition:

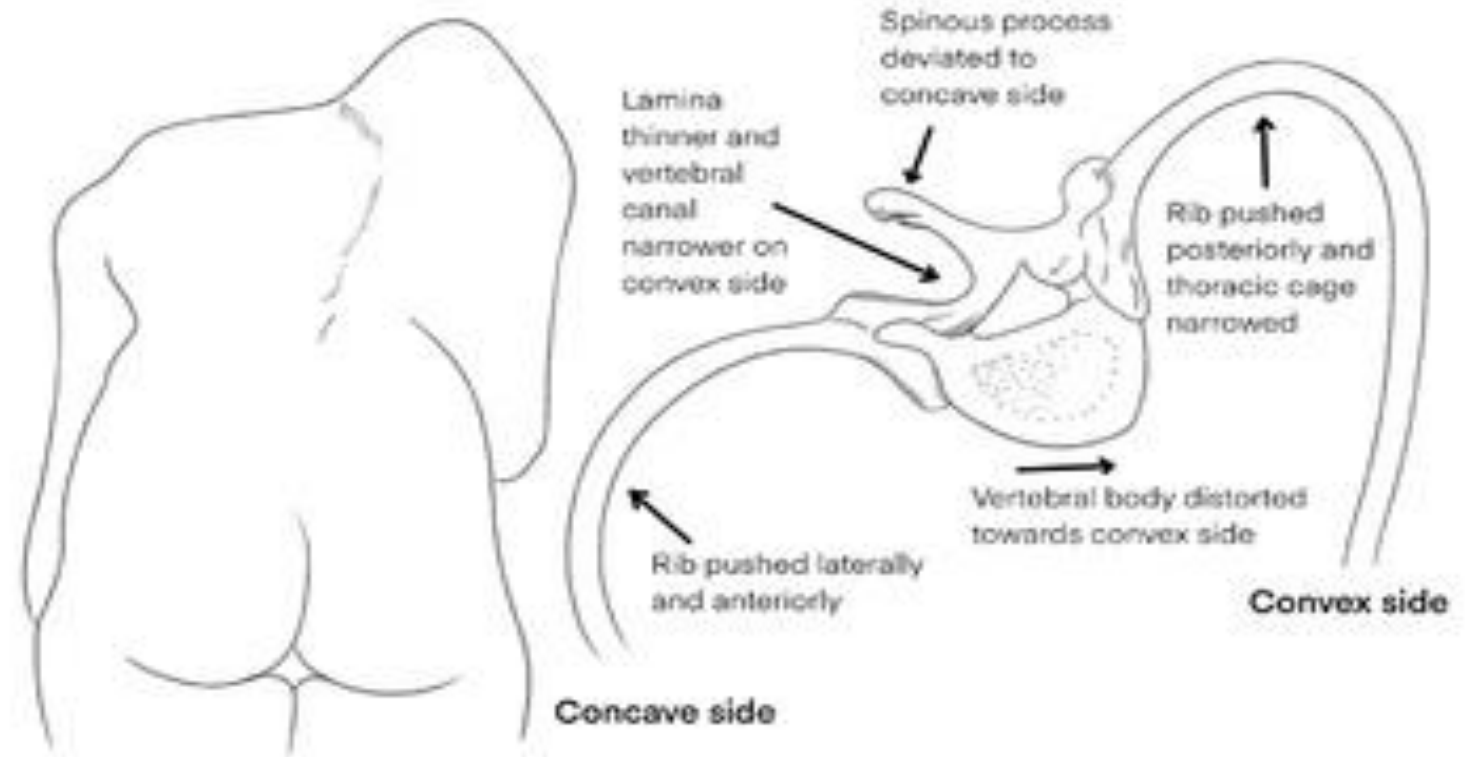
## Types of Curves :

- A scoliotic Curve is always 3D not pure SB or pure rotation alone
- The vertebrae actually change shape and are not symmetrical which results in the curvature of the spine itself.
- Spinal deformity occurs in 3 planes causing lateral, dorsal and different orientation of the endplates
- Conservative measures can not change the bony structure.
- Curves are measured by Cobb angle as in diagram.



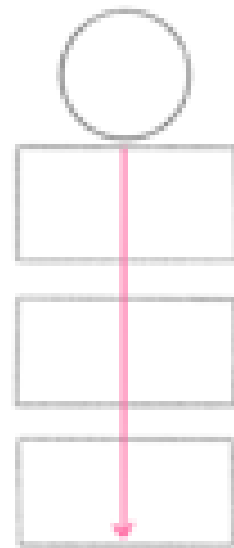
# Scoliosis Definition: Vertebral alignment:

- Rib deformity and vertebral shaping due to scoliosis.

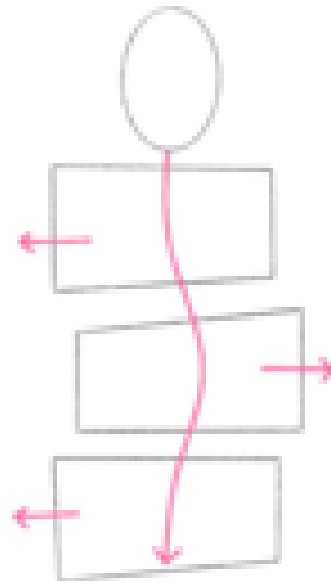


# Scoliosis Definition:

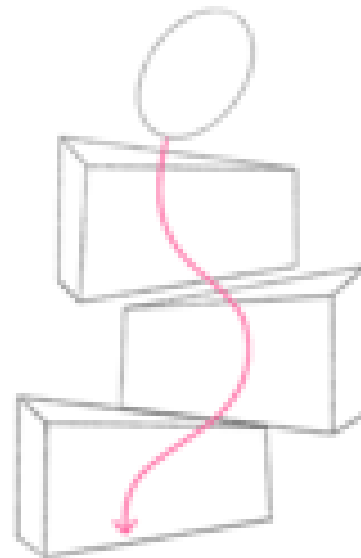
## Scoliosis : Types of curve-blocks



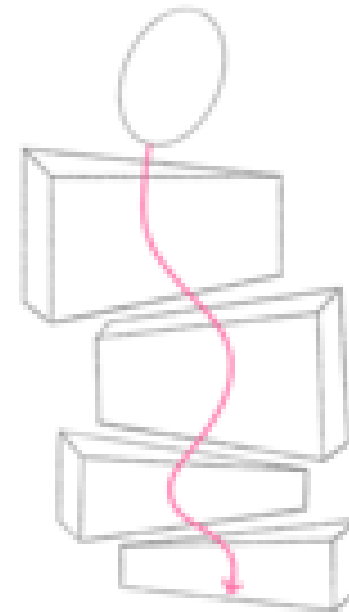
Blocks  
Shoulder  
Rib Cage  
Pelvic



Blocks  
Deviating  
from Vertical  
Line



3-Curve  
Blocks begin  
to wedge and  
rotate around  
vertical axis

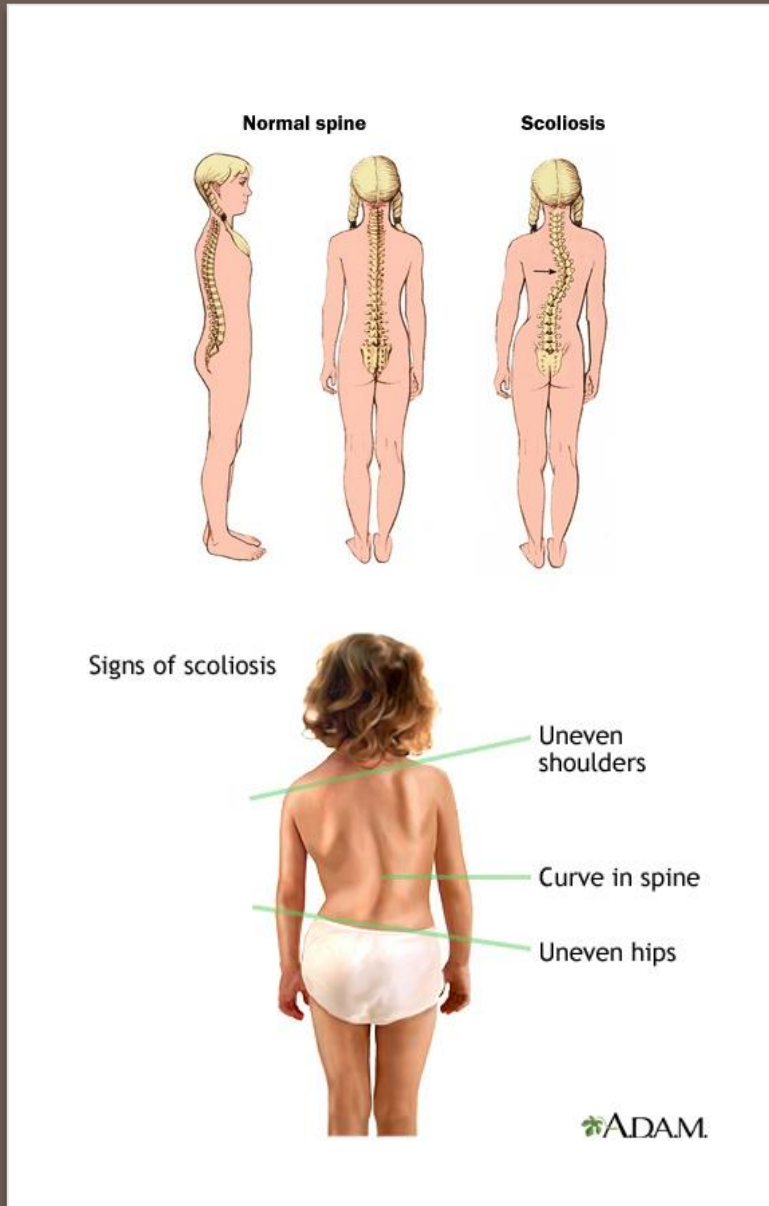


4-Curve  
Additional  
Lumbosacral  
block

# Scoliosis Postural Changes:

In the initial postural evaluation:

- Look for inequalities in height:
  - Shoulders
  - Pelvis
  - Hips
  - Leg positioning
- Arm windows
- Curve in spine
- Head position



Normal spine



Deformity from scoliosis



ADAM

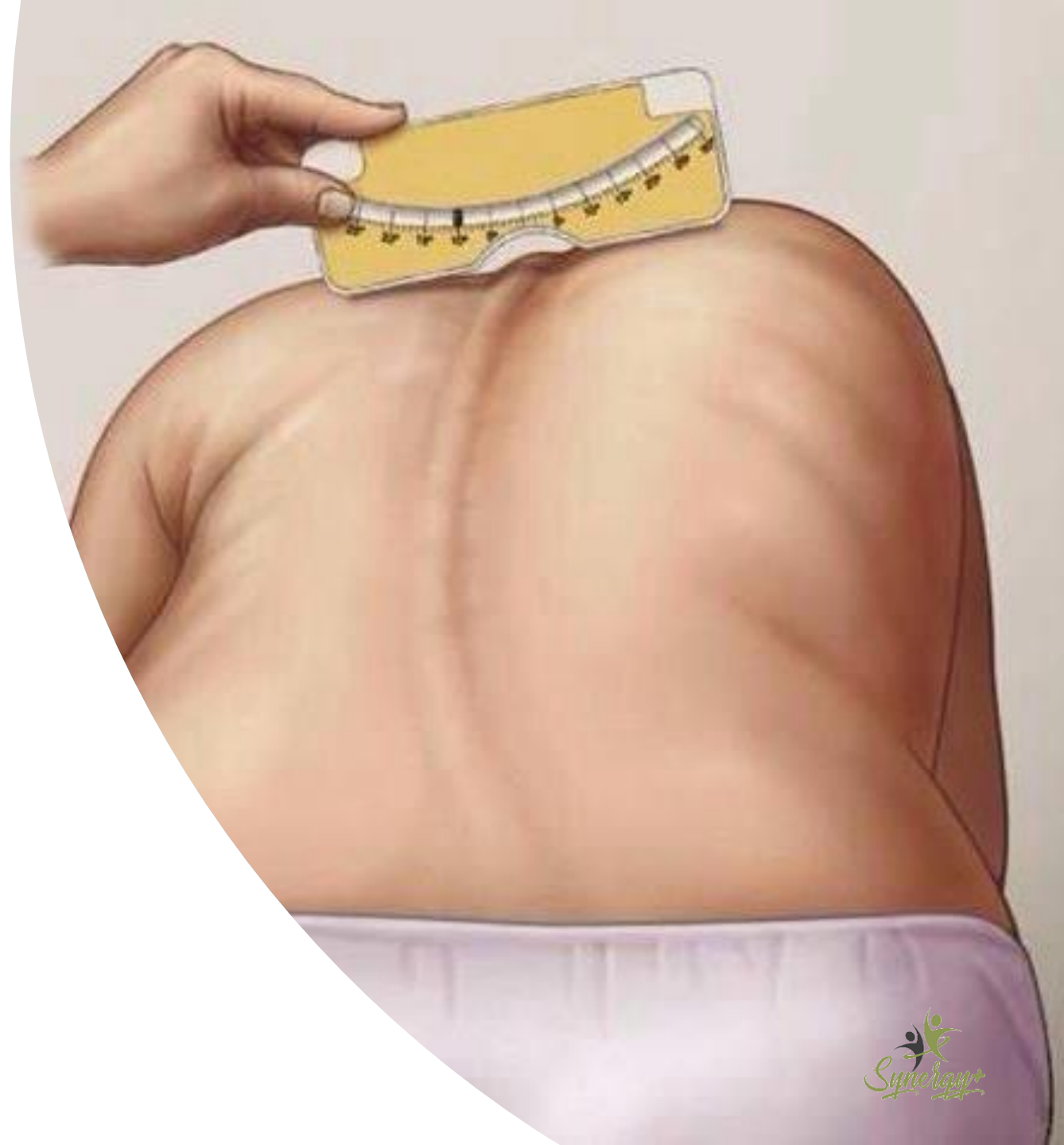
Scoliosis : Presentation/ Posture

Adam's forward bend test:

# Scoliosis : Presentation/ Posture Cobb angle

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- Measured with scoliometer
- 10 degrees or more is considered scoliosis
- Constant re-measuring tool for identifying progression or regression
- Cobb angle classification:
  - 10 degrees- minimum for diagnosis
  - 10-25 –mild
  - 25-40 moderate
  - 40+ - severe



# Scoliosis : Progression of disease

## AIS (Adolescent Idiopathic Scoliosis)

- Ages 10-17
- Diagnosed by:
  - Adams forward bend test 5-7 degrees or more
  - Cobb angle of 10 degrees or more
- True cause is unknown
  - Possibly: neurologic development, vertebral deformity with growth, uneven growth plate formation/ activation, muscular and connective tissue development?
- Accelerates during high growth years and is ideally diagnosed early (pre-puberty). Curve usually stabilizes when growth stops.
- 65% of patients had low bone density score and lower Z-scores (osteopenia or osteoporosis) so cause may be related to poor bone resorption



# Scoliosis : Progression of disease: Adult onset degenerative scoliosis

## Causes:

- Can be AIS that has stabilized
- Can be from previously *undiagnosed* AIS (more classic curve patterns)
- Can be spontaneous or traumatic
- Can be from degenerative joint disease/ DDD in a poor cycle of degeneration vs. slowed growth
- Joint replacements and leg length discrepancies
- Adult onset scoliosis is 60% of the elderly population!

# Scoliosis : Factors that effect scoliosis

- Gravity- can promote asymmetrical loading in the vertebral bodies
- Forward bending: pulls on shortened structures and can cause reactive contractions which are greater on the concavities increasing the curve (this is why Adams test is used for dx)
- Muscle imbalance: both concave and convex muscles are weak (one short and one too long) and need to be elongated to find best ability to contract
- Diaphragm: breathing can be compromised with spinal curvature not allowing full breath into the

# Scoliosis : Intake Questions

- When first diagnosed
- What tests and measures: X-rays, Cobb angle, Riser scores
- Age and stage in life
- Date of menstrual period initiation
- Family history
- Physical activities
- Pain
- Functional limitations
- Breathing/breath?
- Interventions: Bracing, surgery

# Scoliosis : Contraindications

- According to P.T. and Schroth method:
- Avoid loaded Spinal Flexion
  - Increases torsion of the spine and puts it into its curve
- Pure side bending:
  - Does not consider both curves in the “S” shape
  - Does not account for the 3D aspect of the curve (rotational aspect)
- Twisting on its own
- Heavy loading or repetitive loading
- Constant loaded posture will heighten the curve
- Need to know about comorbidities: listhesis, instability of SI, other complicating spinal conditions

# Scoliosis : Contraindications

## What does Pilates say?

- No contraindications for Scoliosis
- Flexion exercises ingrained: Jillian Hessel, Kathy Grant
- Madeline Black: works hard on elongation and does not incorporate flexion much, but does not speak of contraindications

# Scoliosis :

But what *can* we do, then?

- Fix postural alignment (this will minimize axial loading when normal spinal curves are present)
  - Try axial loading test as in postural evaluation presentation
- Spinal elongation on both sides of the spine(will help control gravity forces)
- Re-train breathing equally into both sides of the trunk/body in multiple positions
- Work in neutral spine as much as possible (supported neutral if needed for support)
- Modify flexion based sports (yoga?)
- Pt. education to learn to modify for themselves.

# Scoliosis : Exercise Position Progressions

- Start in Supine (minimize gravity)
  - Side-lying
  - Seated
  - Standing
- 
- (Do not traction)

# Scoliosis : Exercise program requirements

- Determine cause and make treatment plan accordingly:
- Is pain a factor?
- What other underlying issues are there
- Tightness in indirect muscle groups?
- Patient goals: aesthetics?
- Other activities that may be aggravating symptoms



# Scoliosis : Exercises

## Primary focus

- Develop program based on Client need/desire
- Improve Posture
- Decrease pain
- Increase balance in strength by asking for neutral posture and positioning
- Active vs. passive correction

# Scoliosis : Exercise Progression Roller

- Posture in supine= Foam Roller:
- Balance and stability
- Posture
- Exercises to open and elongate trunk:
  - Arm reaches, shoulder slaps, pect stretch
  - Kneeling Lat stretch (neutral spine)
  - Thoracic mobility for muscle tightness (if pain-free)

# Scoliosis : Exercise Progression Mat

- Breathing in neutral (towel support) and work on breath into both sides – practice equal breath bilaterally
- Predict the load
- Quadruped:
  - Pointed Dog
- Side-lying with hip elongation
- Prone glute series (both legs in symmetry)

# Scoliosis : Exercise Progression Reformer

- Side sleeper
- Knee stretch- plank series
- Side plank
- Side sit-ups in short box series (modified)
- Prone presses
- Baby swan (if controlled and not creating flat hinging in thoracic spine)

# Scoliosis : Exercise Progression

## Cadillac

- Side bend (with rotational component)
- Port-a-bras- flat back version
- Mermaid (advanced clients only)

# Scoliosis: Exercise Progression

## Springboard

- Standing arm series: (chest expansion, triceps, rowing, arabesque, etc.)
  - Emphasis on balance and posture (height)
- Squats and jumping
- Prone shoulder series from pect/ lat stretch and swan  
add glute series

# Scoliosis: Exercise Progression Chair

- Kneeling arm presses
- Seated leg presses
- Prone series (swan, powerhouse, side sit ups)
- Standing leg lowers including balance on the bar
- Lunge series

# Scoliosis : Exercise Progression

## Barrell and Arc

- Side bend stretch with slight rotation
- Thoracic extension
- Swimming with elongation





# Scoliosis : Exercises

- Which Pilates exercises will make the functional life safer?



## Treatment Results

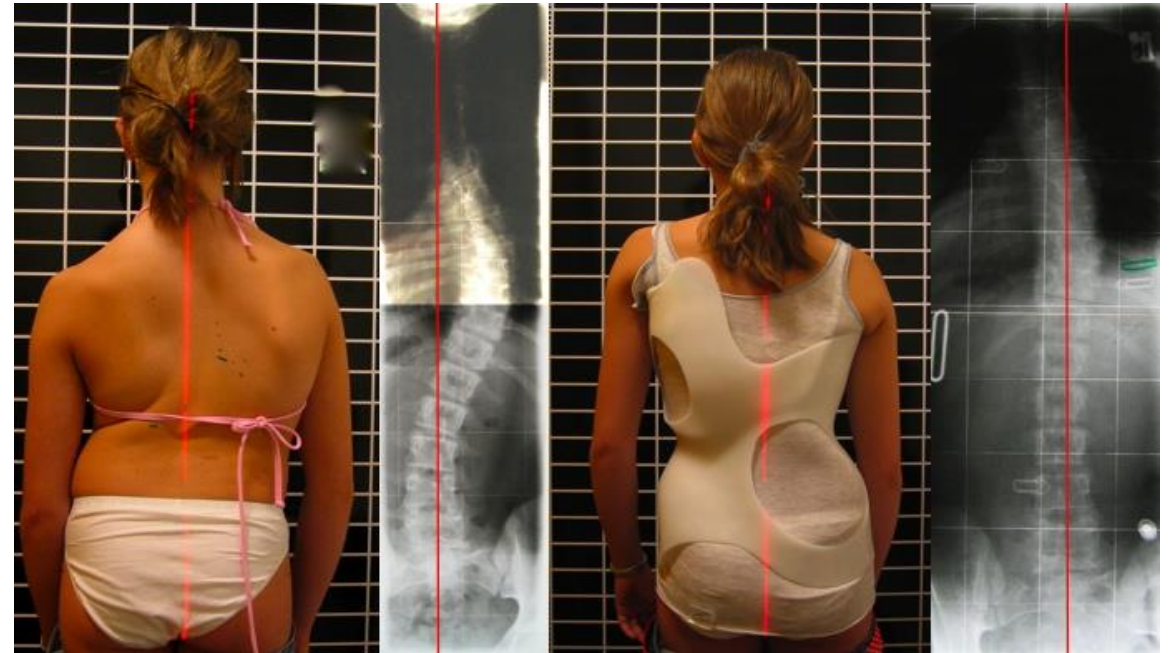


pre treatment

In treatment

3 months

12 months



Scoliosis Other Interventions:

Bracing



# Scoliosis Other interventions:

- Surgical fusion with rods:
  - Consider segments above and below
  - Lessens the curve for those who are at high risk of progression
  - Does not correct 100%
  - Decreases pain
  - Limits ROM, but may increase function.



# Conclusion

- When to refer out?
- If undiagnosed and you suspect scoliosis- all patients should be under the watch of an MD
- Increased pain and increased progression of curve.
- Most at risk are young AIS patients between the ages of 10-13 with Risser of 0-3 with high degree of curvature already. They need to be monitored for worsening curve closely.

# References

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3. Adolescent Idiopathic Scoliosis: <http://www.srs.org/patients-and-families/conditions-and-treatments/parents/scoliosis/adolescent-idiopathic-scoliosis>
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