Posture

Kinesiology
RHS 341
Lecture **10**
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Posture

- = body alignment
- = the relative arrangement of parts of the body
- Changes with the **positions** and **movements** of the body throughout the *day* and throughout *life*

Good posture

- “the state of ***muscular*** and ***skeletal*** balance which ***protects*** the supporting structures of the body ***against injury*** and progressive deformity”

- “when the muscles function most efficiently”

(The American Orthopedic Association, 1946)

Factors affecting posture

- General health
- Body build
- Gender
- Strength and endurance
- Kinesthetic awareness
- Personal habits
- Demands of the work place
- Social and cultural traditions

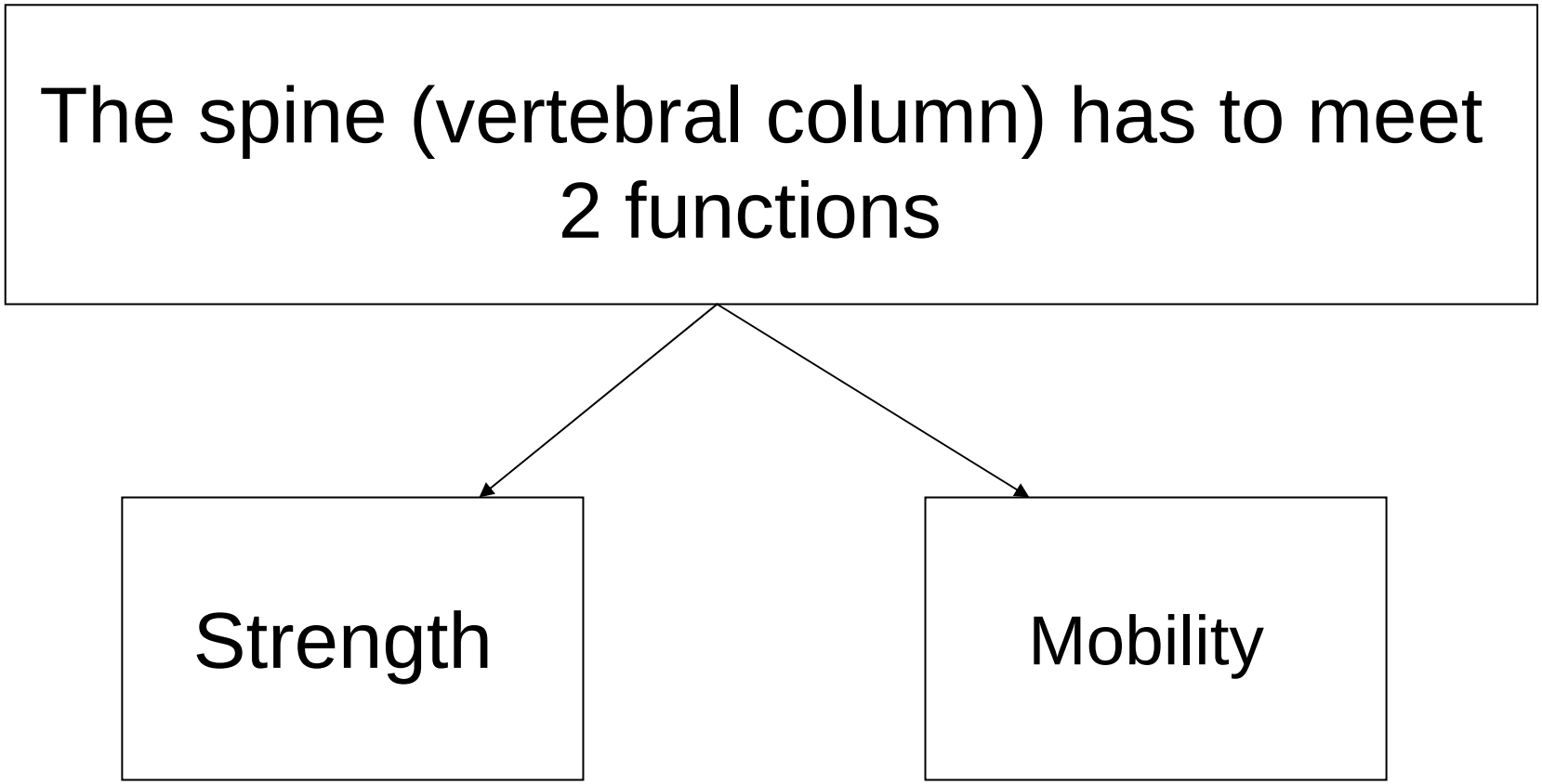
Posture description

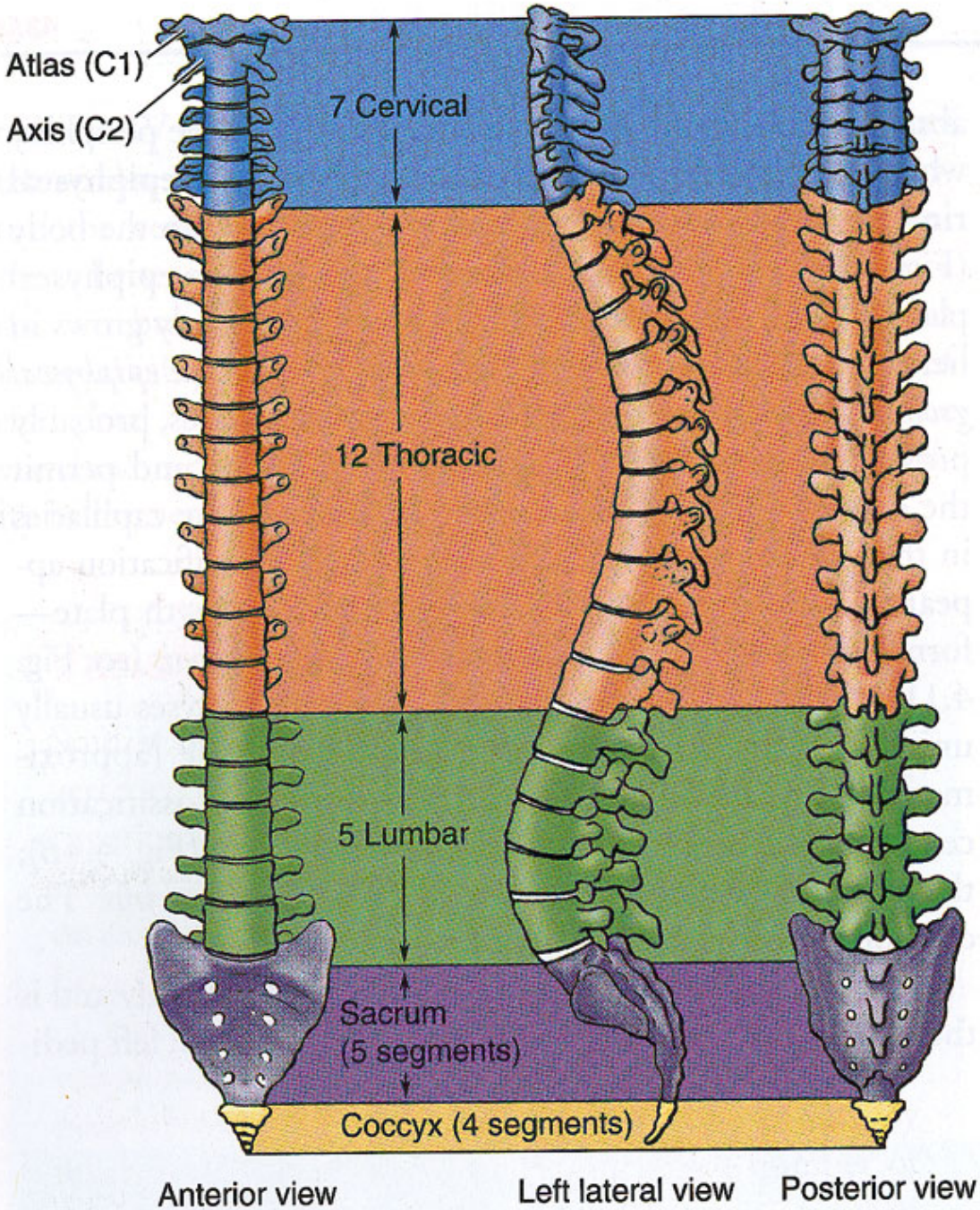
- **Static (rest) posture** = posture in rest or without anticipated action (e.g., lying, sitting, standing)

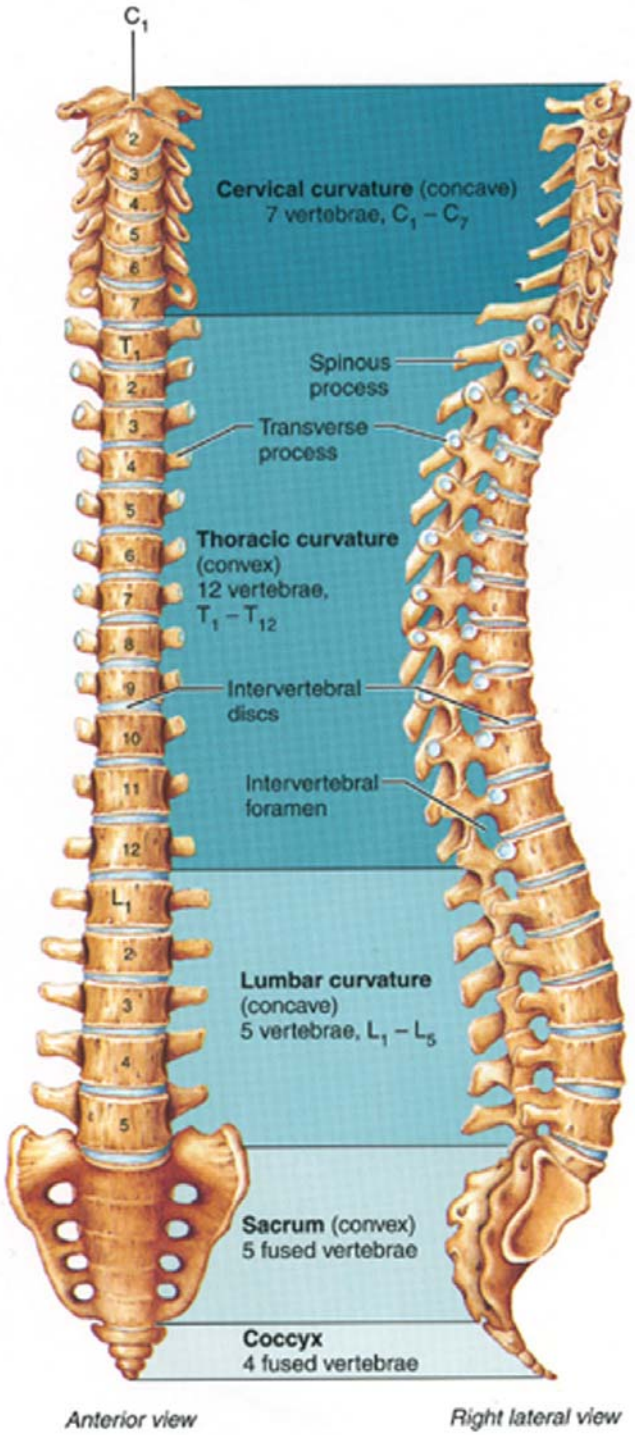
- **Dynamic posture** = posture in action or in anticipation of action

Posture description

- Efficiency of motion is determined by:
  - ➢ The posture maintained in the **trunk**
  - ➢ Positioning of the **vertebral segments** (stresses imposed upon the spine)


The spine (vertebral column) has to meet 2 functions
Strength
Mobility


Atlas (C1)
Axis (C2)
7 Cervical
12 Thoracic
5 Lumbar
Sacrum
(5 segments)
Coccyx (4 segments)
Anterior view
Left lateral view
Posterior view


C1
2
3
4
5
6
7
T1
2
3
4
5
6
7
8
9
10
11
12
L1
2
3
4
5
Cervical curvature (concave)
7 vertebrae, C1 – C7
Spinous process
Transverse process
Thoracic curvature
(convex)
12 vertebrae,
T1 – T12
Intervertebral discs
Intervertebral foramen
Lumbar curvature
(concave)
5 vertebrae, L1 – L5
Sacrum (convex)
5 fused vertebrae
Coccyx
4 fused vertebrae
Anterior view
Right lateral view

Posture and life cycle

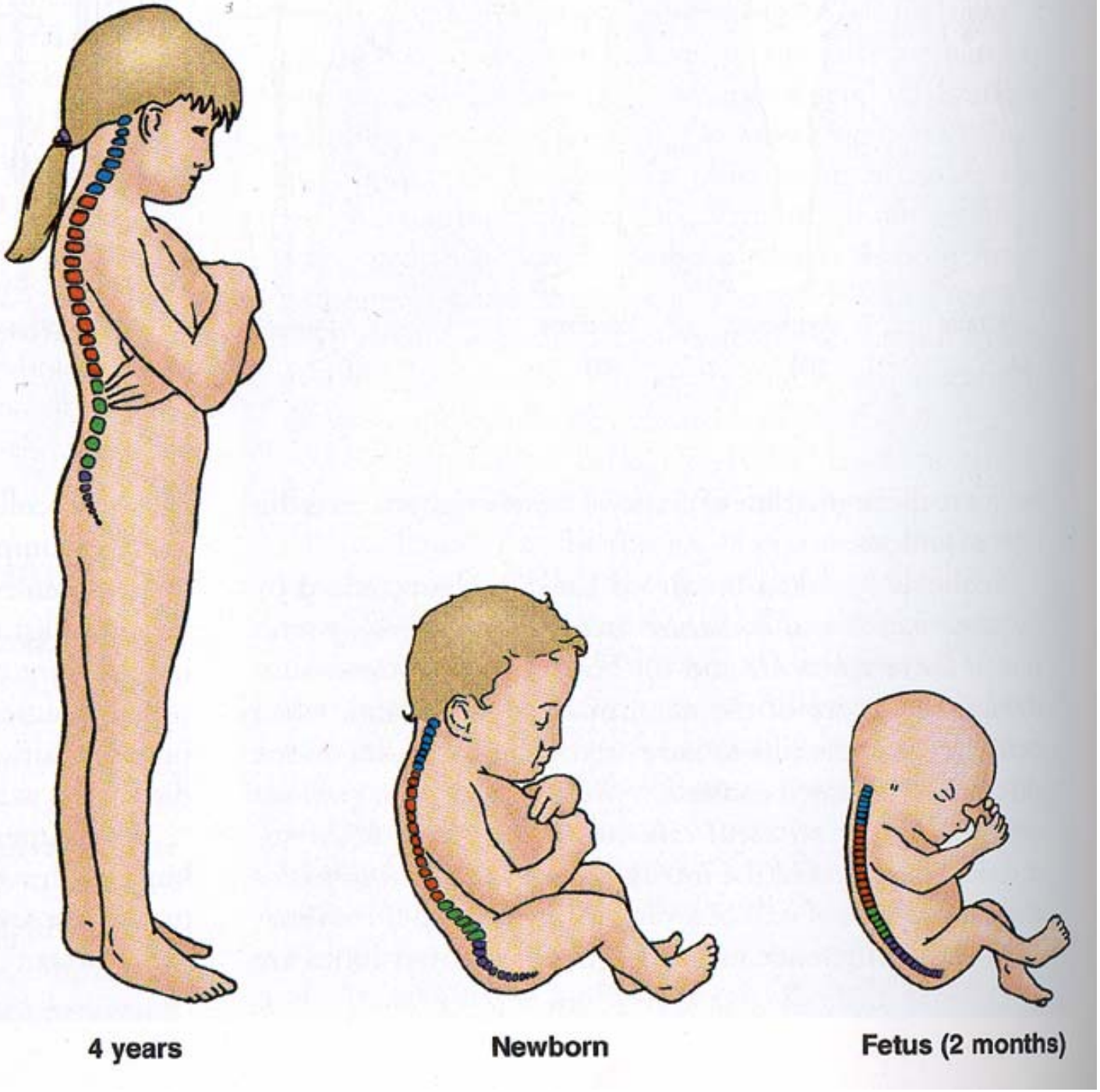
- Infants' ability to assume and maintain upright posture is limited because their ***postural reaction*** still needs to be perfected

- Upright standing posture is inherently unstable <u>because</u> the body's center of gravity is situated high above a relatively small base of support

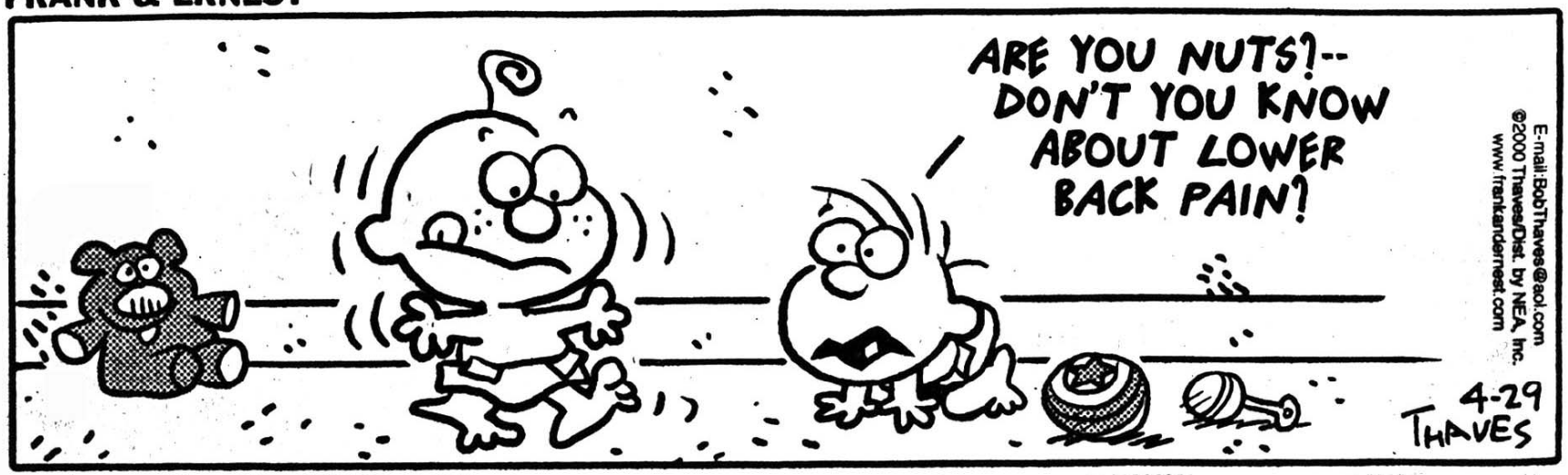

TECNICA
TECNICA

Posture and life cycle

- **Spinal curvature:**
  - In the **neonate**: the whole spine is flexed forming a “C” shaped curve (convex posteriorly) from the occiput to the sacrum
  - When the infant begins to **lift his head**: the ***cervical*** curve reverses to become convex anteriorly
  - As the toddler begins to **sit and stand**: the ***lumbar*** curve reverses like the cervical


4 years
Newborn
Fetus (2 months)

FRANK & ERNEST



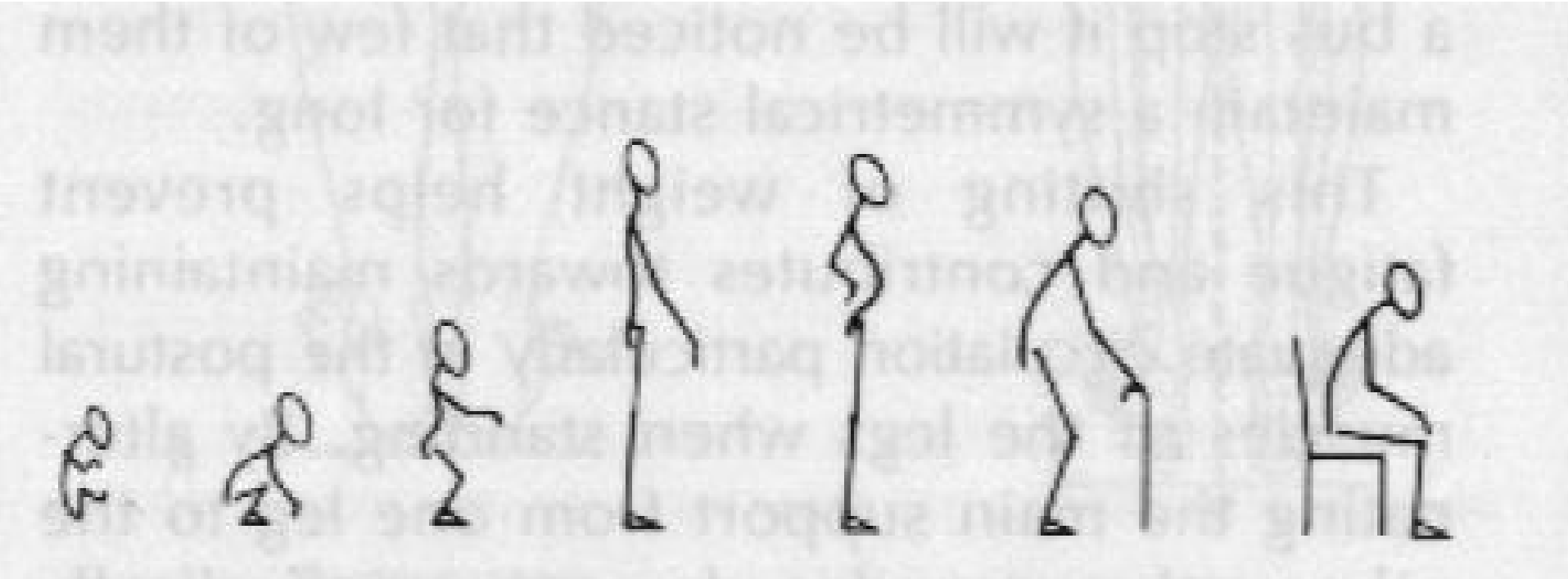
Posture and life cycle

Once the standing position is achieved, the spine has four curves:

1. **Cervical curvature**: convex anteriorly (secondary)
2. **Thoracic curvature**: convex posteriorly (primary)
3. **Lumbar curvature**: convex anteriorly (secondary)
4. **Sacral curvature**: convex posteriorly (primary)

Posture and life cycle

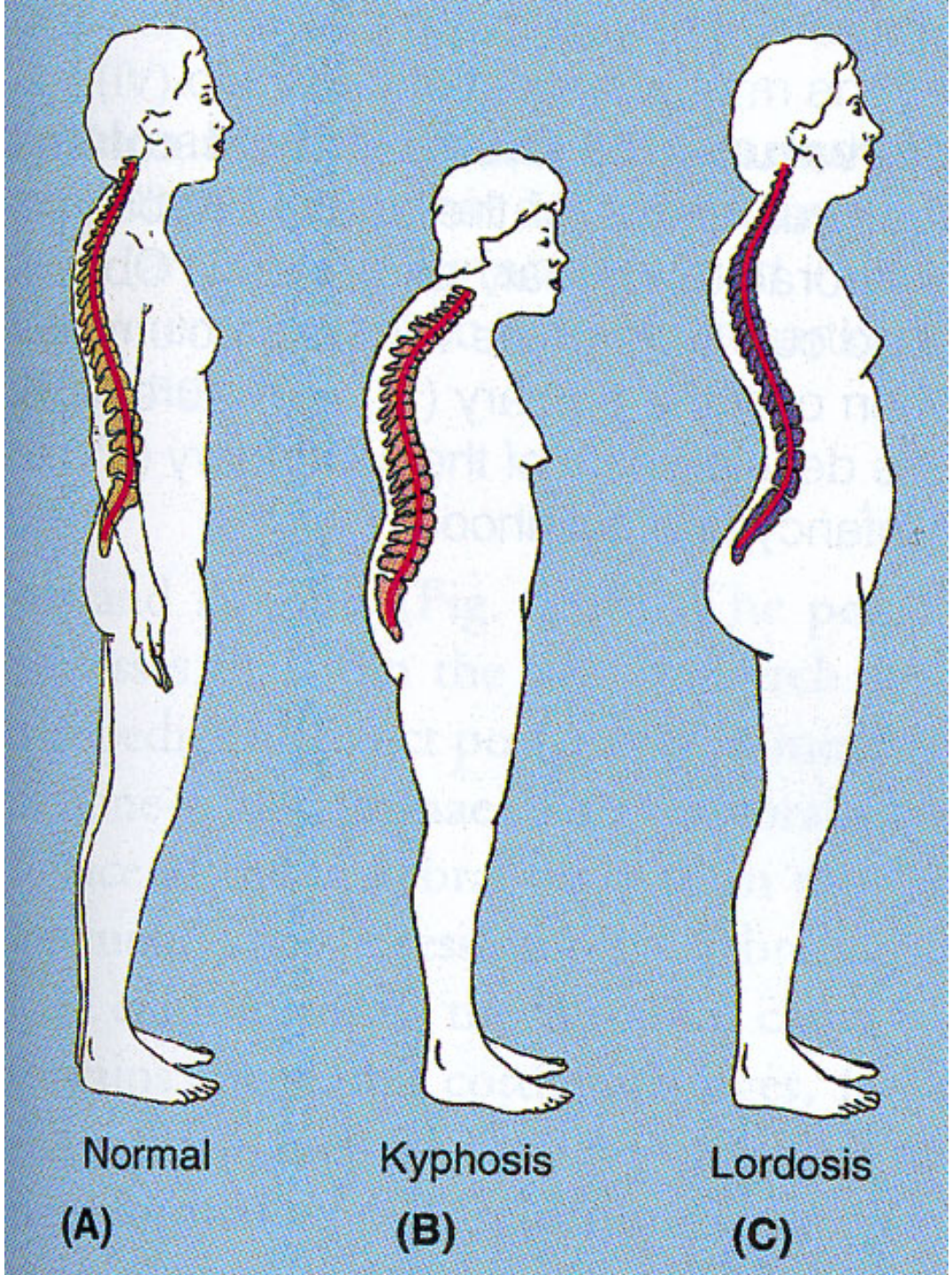
- **In old age:**
  - the shape of the spine tends to revert back to the “C” shaped curve
  - **spinal flexibility** is greatly reduced
  - in some elderly, the cervical curve may increase as they try to keep their eyes directed parallel to the floor, so that they can look ahead



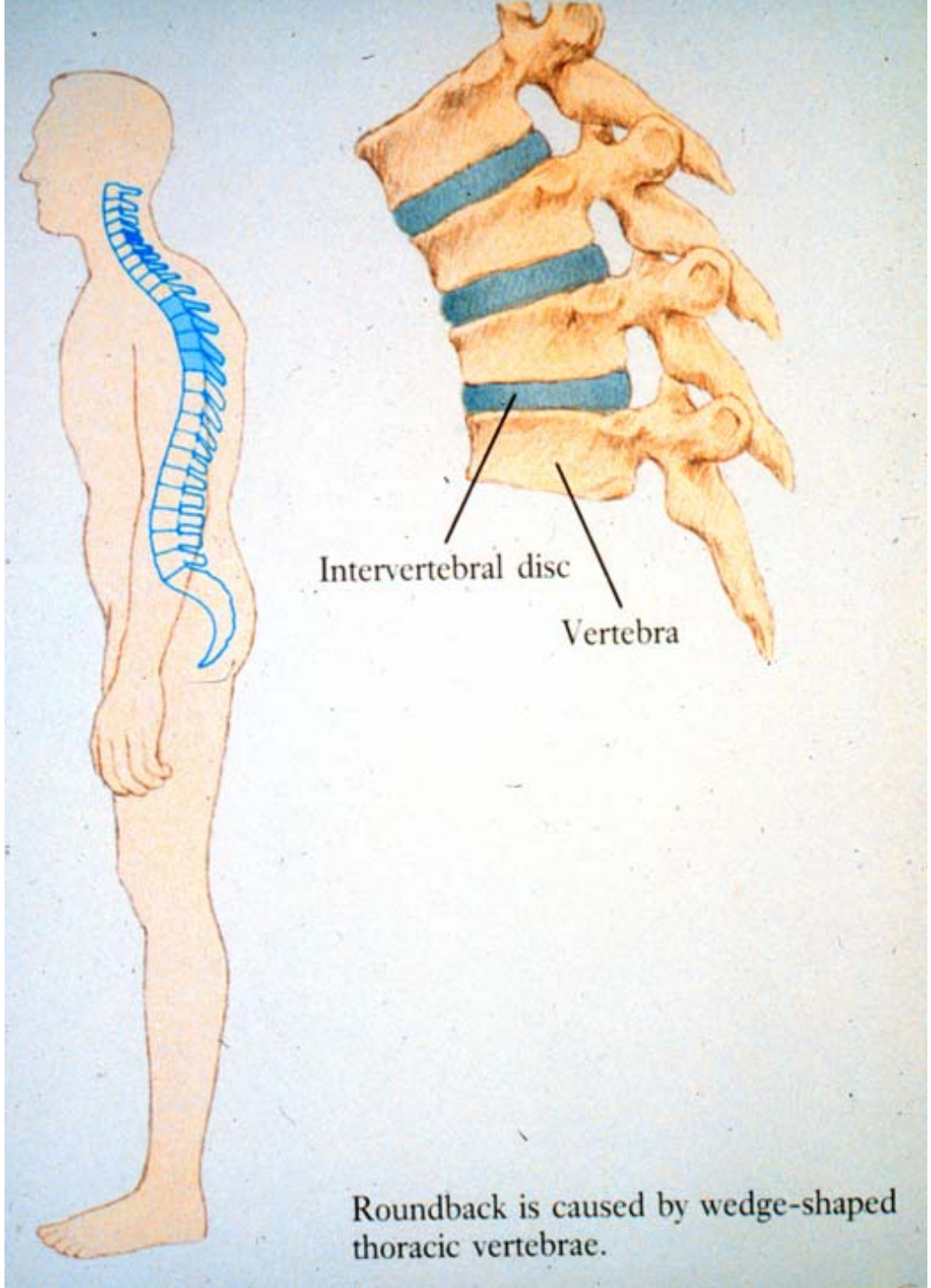
The seven ages of man

Abnormal posture

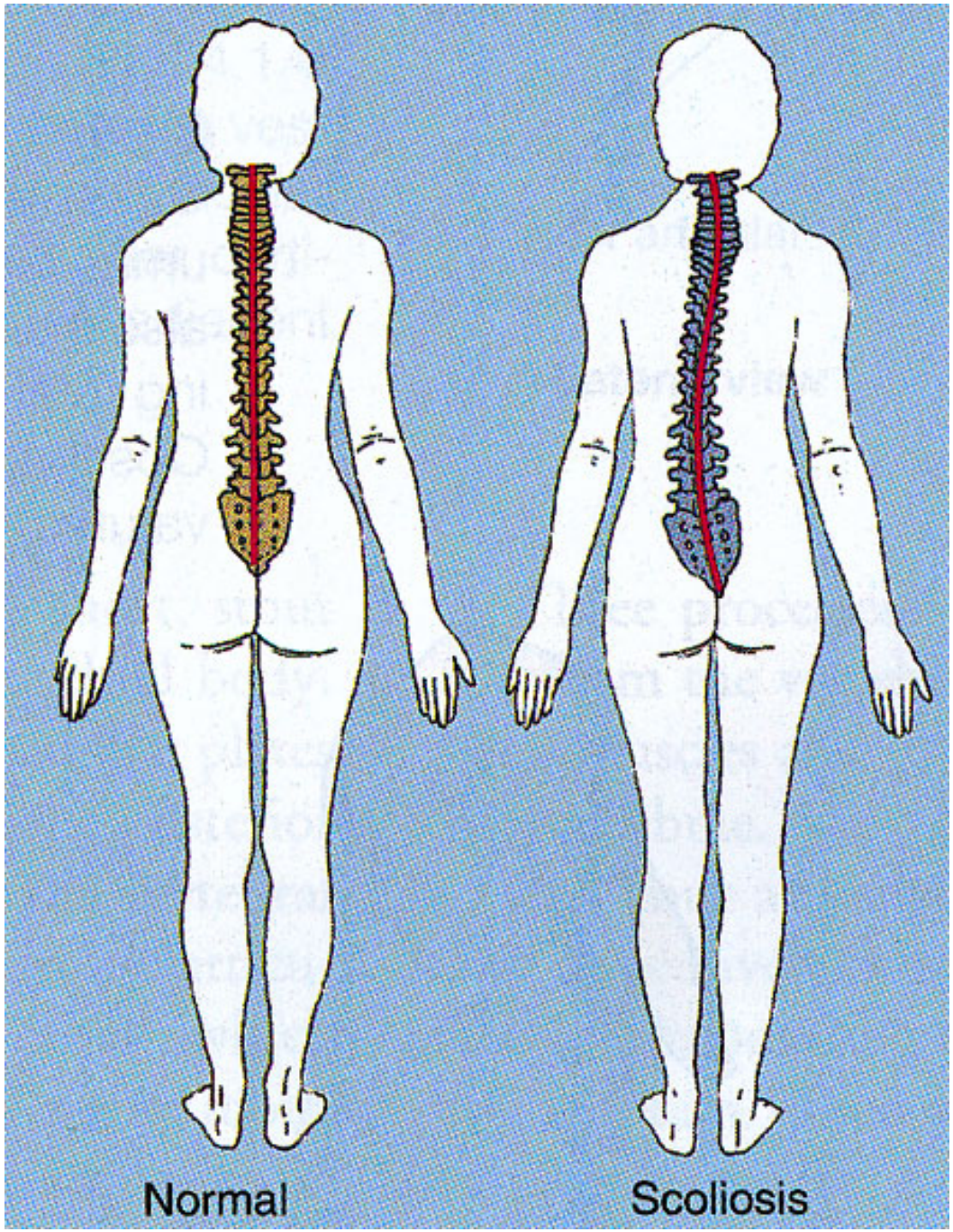
- **Lordosis** = an increase in the anterior lumbar curve
- **Kyphosis** = an increase in the posterior thoracic curve
- **Scoliosis** = lateral curvature


Normal
(A)
Kyphosis
(B)
Lordosis
(C)

Kyphosis



Roundback is caused by wedge-shaped thoracic vertebrae.


Normal
Scoliosis

Abnormal posture

- **High heels** shoes throw the body weight forward, so the spine may adapt by increasing the lumbar curvature (lordosis)

- **Scoliosis** may affect the shape of the thorax, which may create problems in breathing

Abnormal posture

- **Degenerative changes in the spine** due to disease or aging may lead to permanent deformity

Standing posture

- To maintain upright standing posture, the **“S” shaped spine** acts as an elastic rod to support the weight

Standing posture

- Since the center of gravity lies ***in front*** of the spine →

  a continuous *<u>forward</u> bending moment* is imposed upon the trunk in standing →

  the posterior muscles and ligaments must control and maintain the standing posture

Standing posture

- **Erect posture**: activity in the ***erector spinae*** muscle (trunk extensors)

- **Slouched posture**: the ***ligaments*** and joint ***capsules*** take most of the responsibility for maintaining the posture

Postural sway

- Standing is ***not a static position***: the upright position is maintained by the **alternating action of various muscles** to keep the body's center of gravity over the base of support

- The magnitude of sway (as determined by the path of the body's line of gravity) tends to be **larger in the very old and very young**

Postural sway

- **Prevents fatigue** (because of the alternating periods of activity and inactivity in the motor units)

- Assist venous return

Postural sway

- Affected by:
  - Vision
  - Ankle and foot proprioceptors

Standing posture

- Postural sway in standing is controlled by:
  - The erector spinae muscles
  - The abdominal muscles
  - The psoas major

- All of these muscles are slightly active in standing, with **more activity in the thoracic region** than the lumbar and cervical regions…….why?

Standing posture

- The ***ideal standing posture*** is one in which the line of gravity runs:

  - Through the mastoid process
  - Just in front of the shoulder joint
  - Just behind the hip joint
  - Just in front of the center of the knee joint
  - In front of the ankle joint

Line of gravity

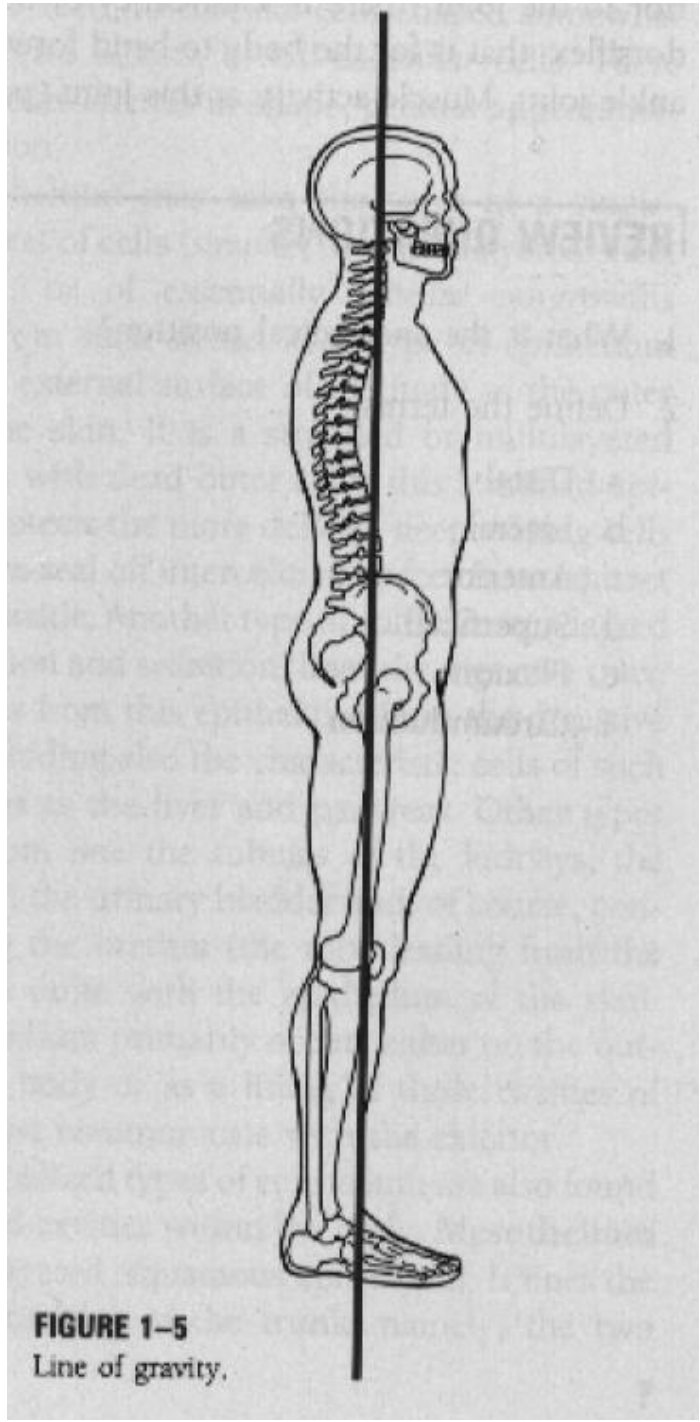
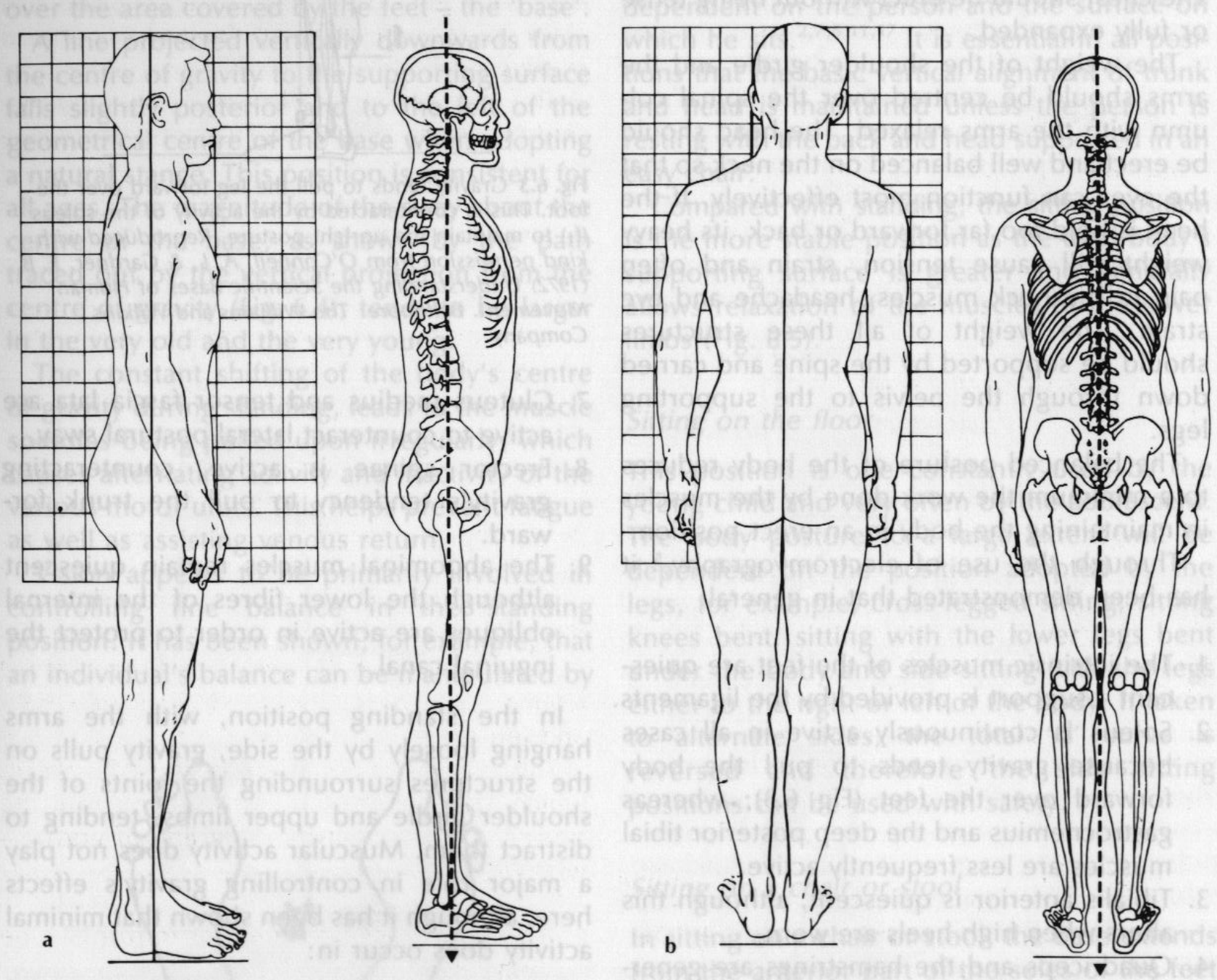


FIGURE 1–5
Line of gravity.


a
b
Lateral View
Posterior View

Standing posture

- An ideal balanced posture reduces the work needed by the muscles to maintain the body in erect position

Standing posture

- Muscles active in standing:
  - ***Soleus*** is continuously active because gravity tends to pull the body forward over the feet
  - ***Iliopsoas*** remains constantly active
  - ***Gluteus medius*** and ***tensor fascia lata*** are active to counteract lateral postural sway
  - ***Erector spinae*** muscles are active to counteract gravity's tendency to pull the trunk forward

Sitting posture

- Requires less energy expenditure and imposes less load on the lower limb than standing

- But, prolonged sitting can have negative effects on the lumbar spine

Sitting posture

- **Unsupported sitting**: high muscle activity in the thoracic region, with low levels of activity in the abdominals

Sitting posture

- **Unsupported sitting** places more load on the lumbar spine because it creates:
  - a backward pelvic tilt
  - a flattening of the lower back
  - forward shift in the center of gravity

⟶ places load on the discs and the posterior structures of the vertebral column (ligaments, capsules, muscles)

Sitting posture

- **Supported sitting**: the load on the lumbar vertebrae is less than unsupported sitting

Sitting posture

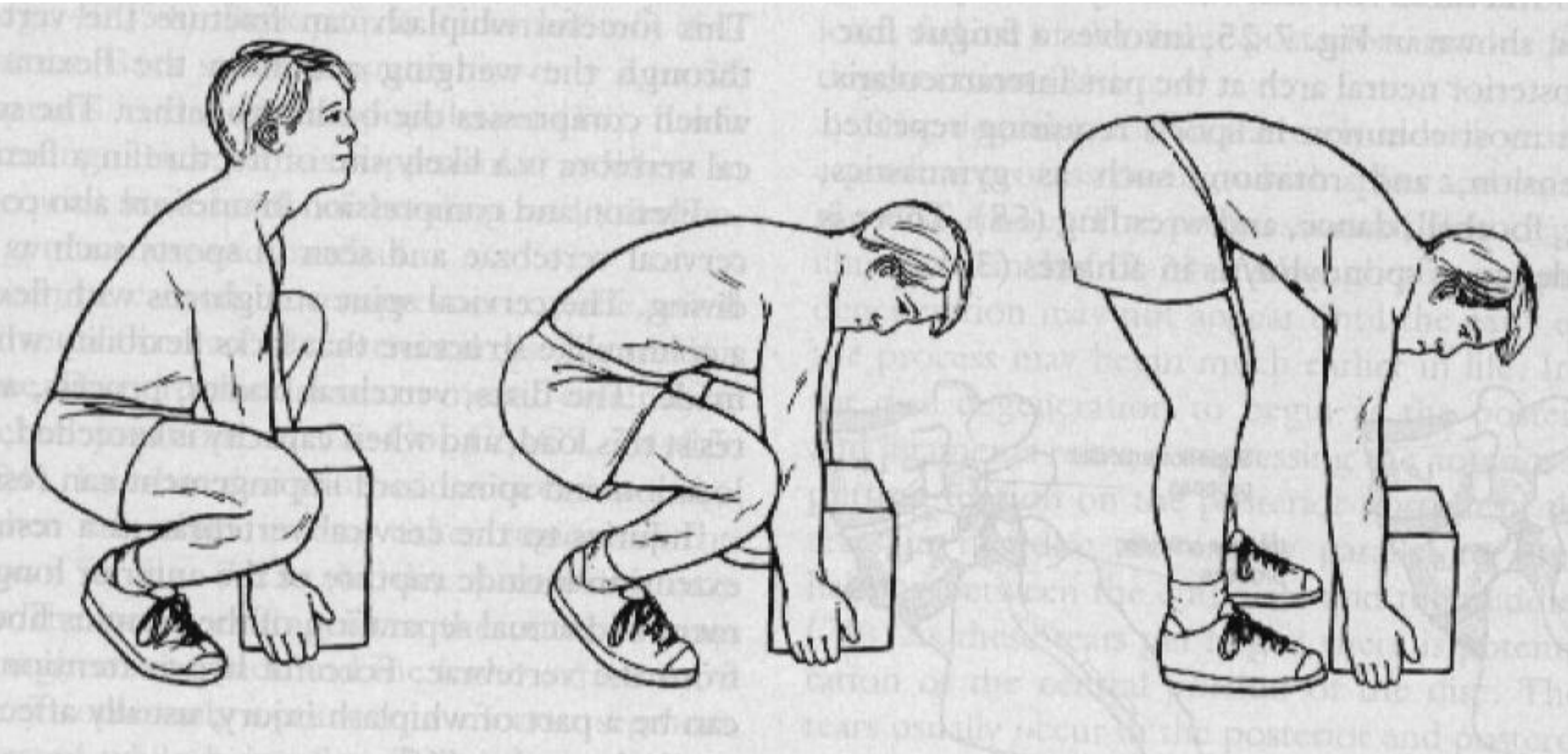
- Prolonged sitting in a flexed position may:
  - ➢ increase the resting length of the erector spinae muscles
  - ➢ overstretch the posterior ligamentous structures

Sitting posture

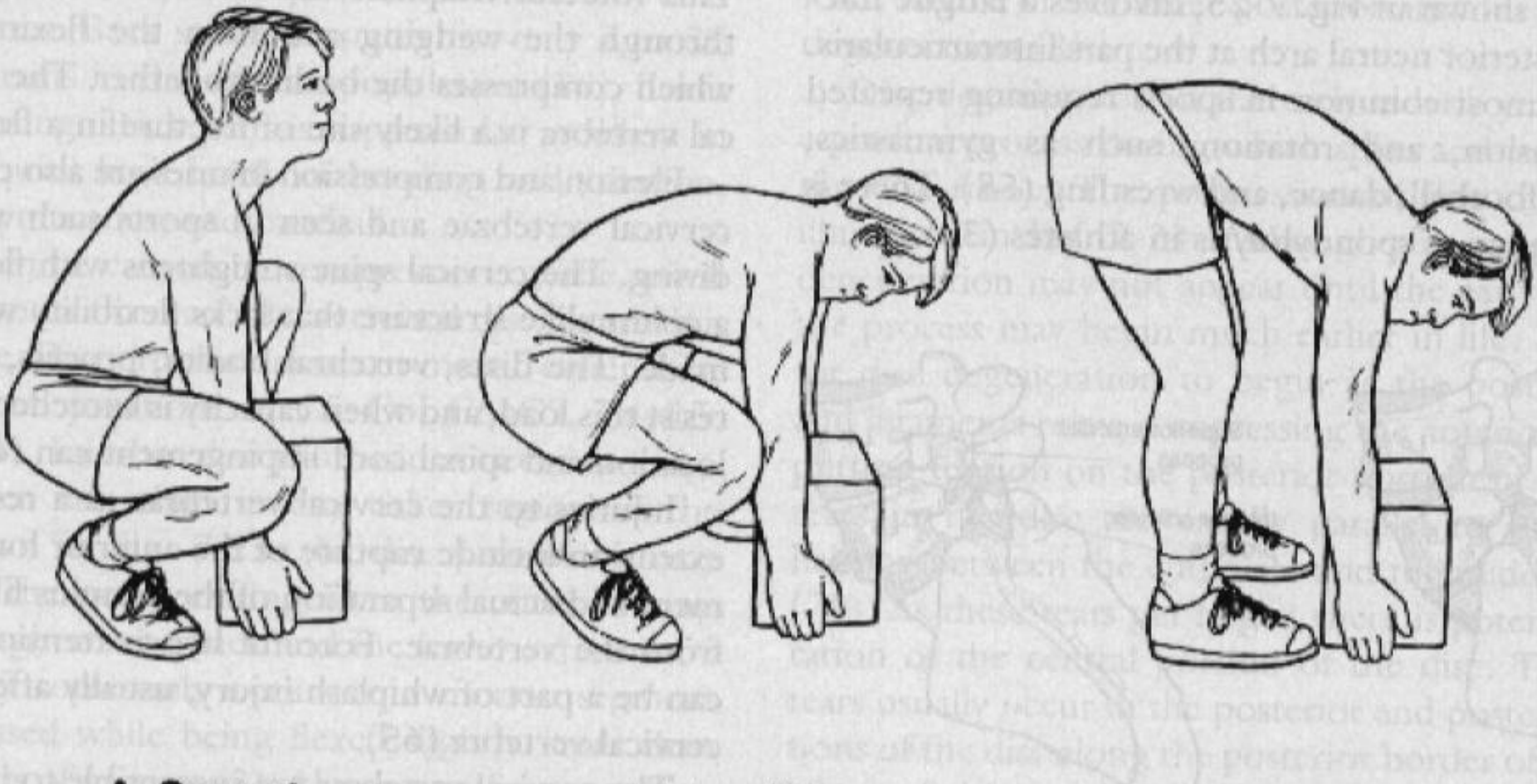
- **Ergonomic intervention:**
  - Raising the height of the work station (to reduce flexion of the cervical and lumbar regions)
  - The use of foot rest (to relieve strain)
  - Symmetrical working position (to reduce the incidence of twisting which stretches the posterolateral structures, particularly the annulus)

Lifting

- Lifting may result in a ***back injury*** as a result of:
  - the weight of the load
  - the distance of the load from the body

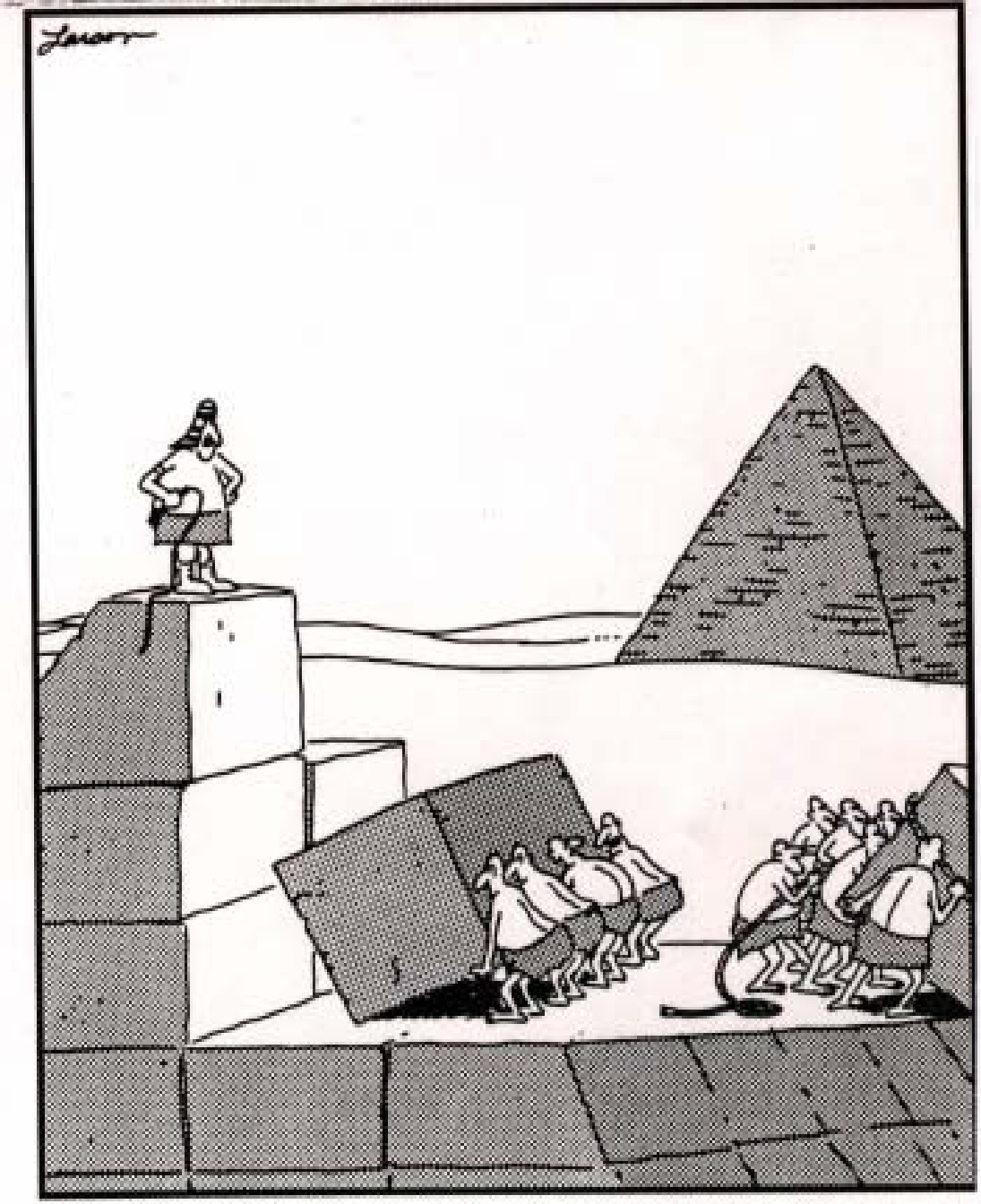


Identify the best lifting strategy and explain why?



A. Correct **B. Leg lift** **C. Back lift**

FIGURE 7-26 Low back injury can be reduced if proper lifting techniques are used. The most important consideration is not whether you use your legs, but where the weight is with respect to your body. Proper lifting technique has the weight close to the body with the head up and the back arched **(A)**. The leg lift technique **(B)** is no better than the back lift **(C)** if the weight is held far from the body. Both B and C should be avoided.



"Remo! Lift with your knees, not your back!"

Lifting

- **Proper lifting posture** is one in which:
  - the back is erect
  - knees are bent
  - weight is close to the body
  - movement occurs through one plane only (avoid twisting)

Lifting

- **Stooped lifting posture** reduces the activity in the trunk extensor ⟶

  so the forward moment is resisted by ***passive structures*** (discs, ligaments, fascia) ⟶

  placing these structures at ***risk of injury***