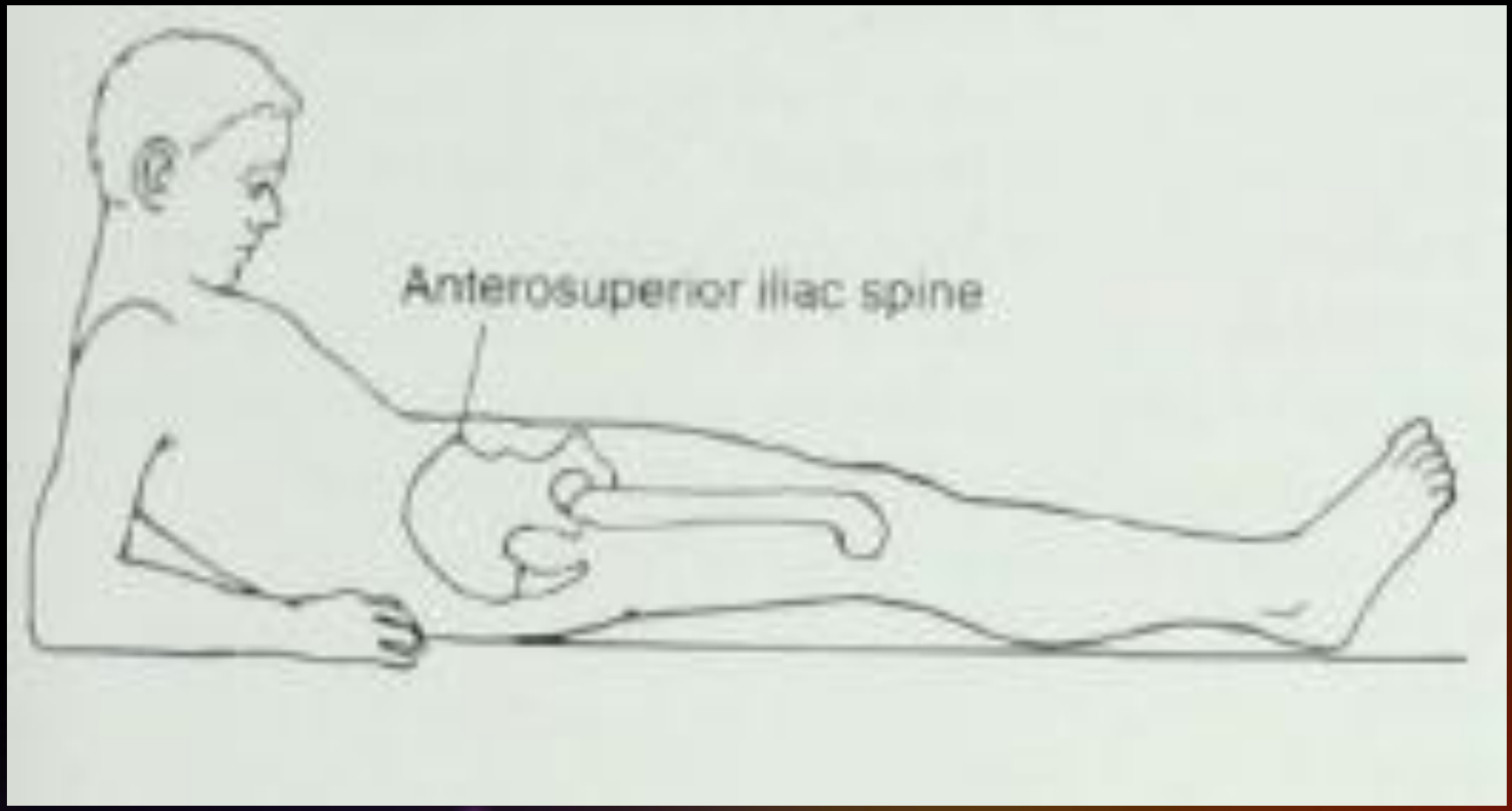
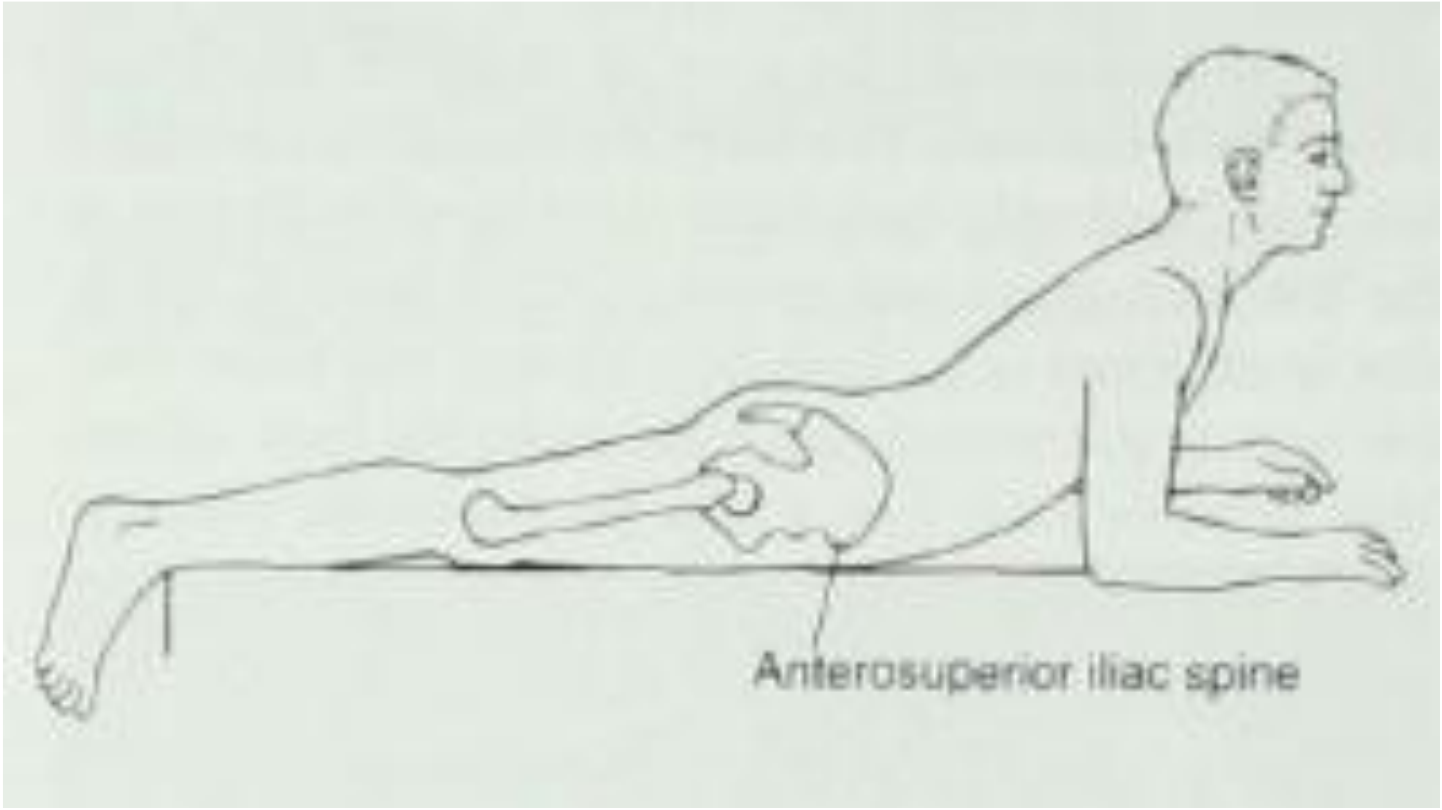
Muscles Testing & Function with Posture & Pain

Chapter 5: Trunk Range of motion: Flexion and Extension

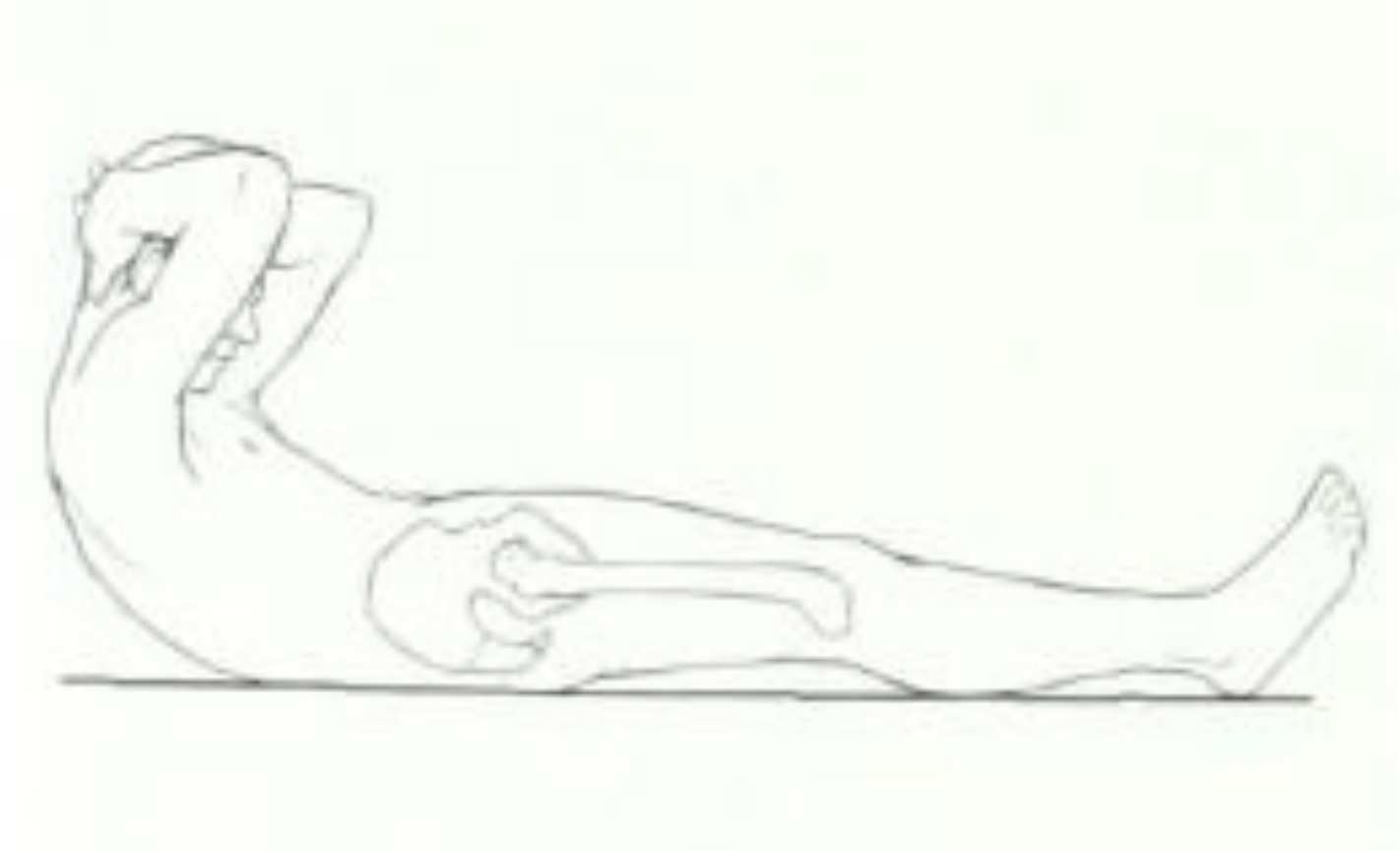

Anterosuperior iliac spine


Anterosuperior iliac spine

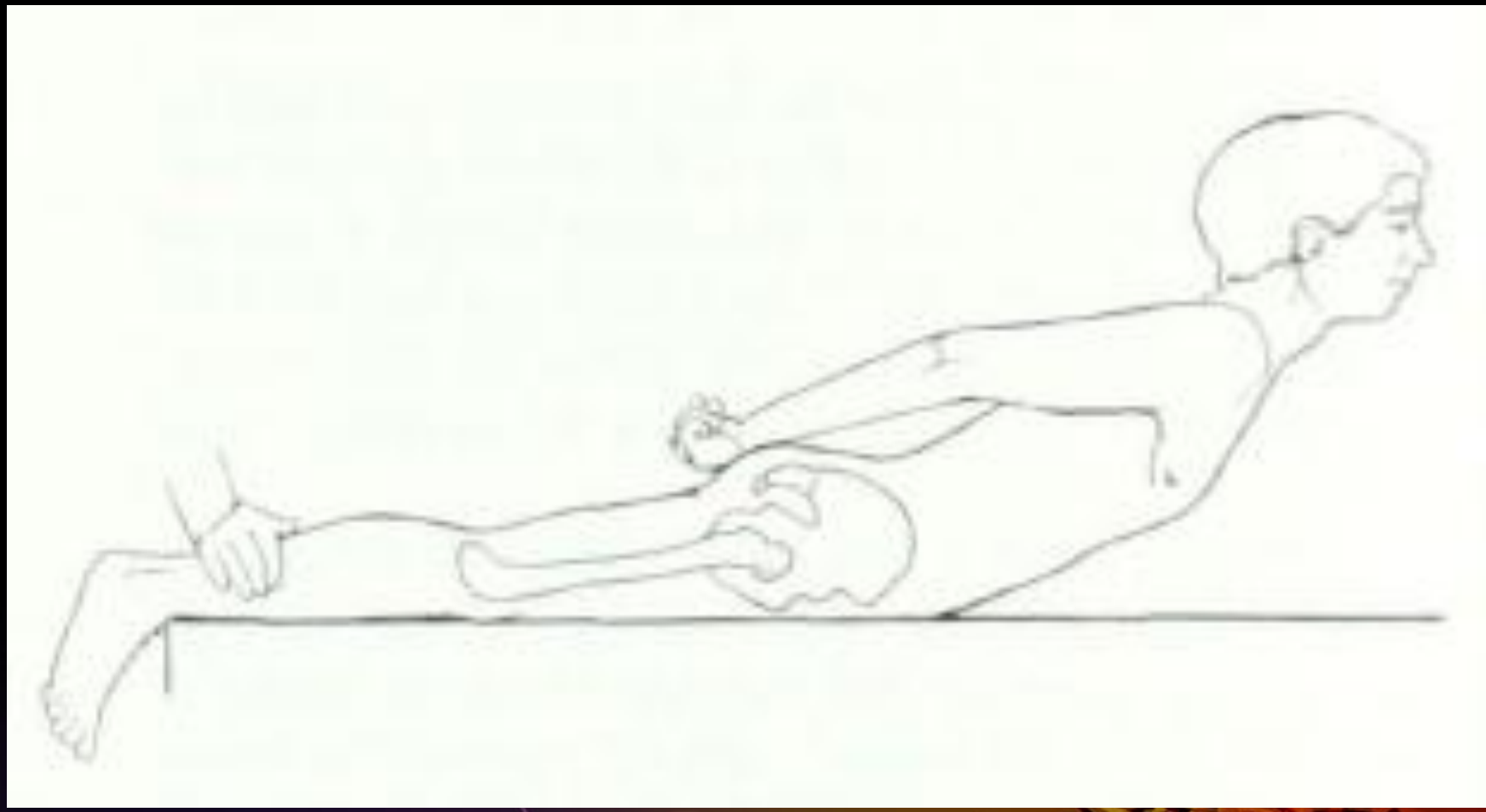
Scapular instability and, specifically, serratus anterior weakness can interfere with the back extension test, as seen in the accompanying photograph.

Note: *Push-ups should not be done by individuals who exhibit this type of weakness.*

Movements of The Vertebral Column

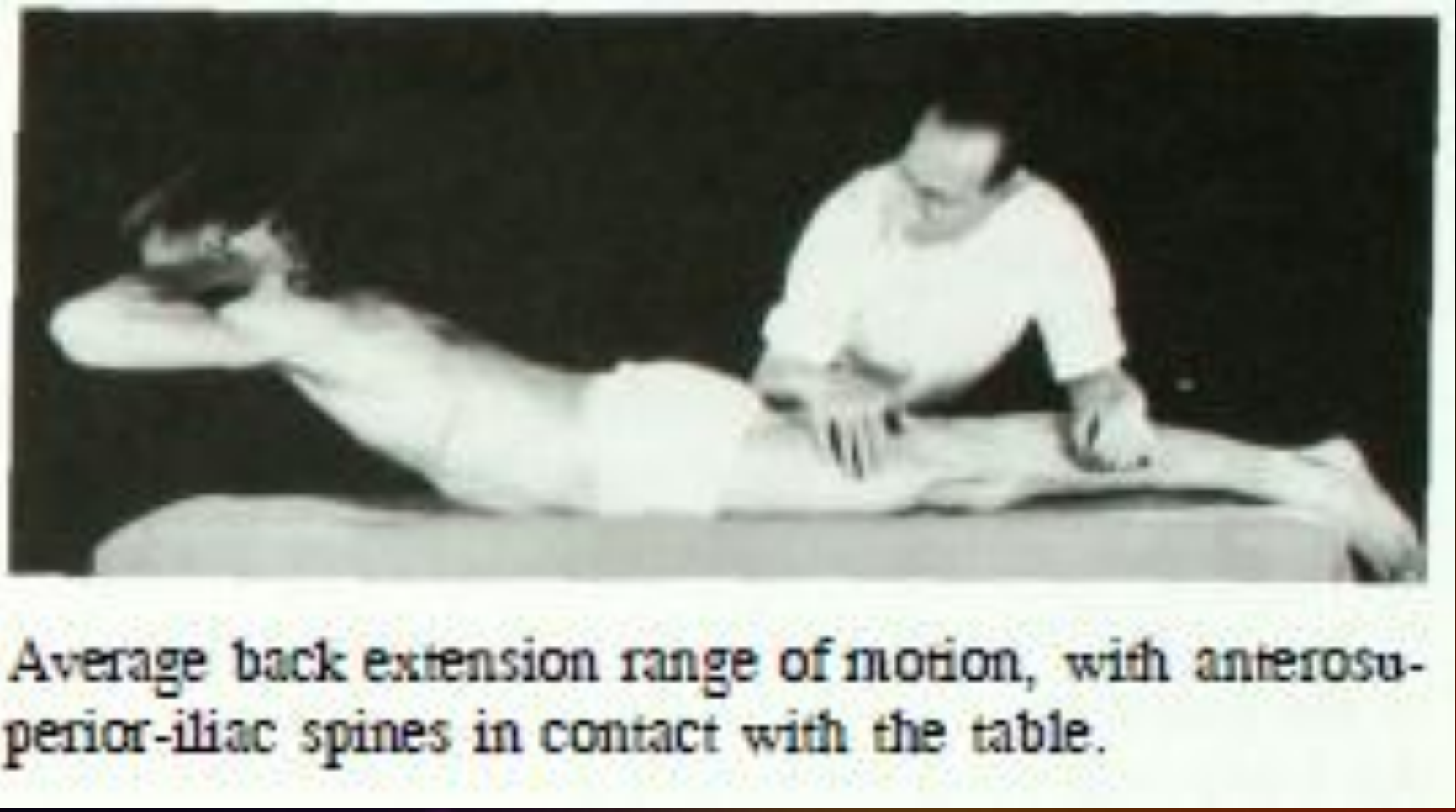


Movements of The Vertebral Column



Movements of The Vertebral Column

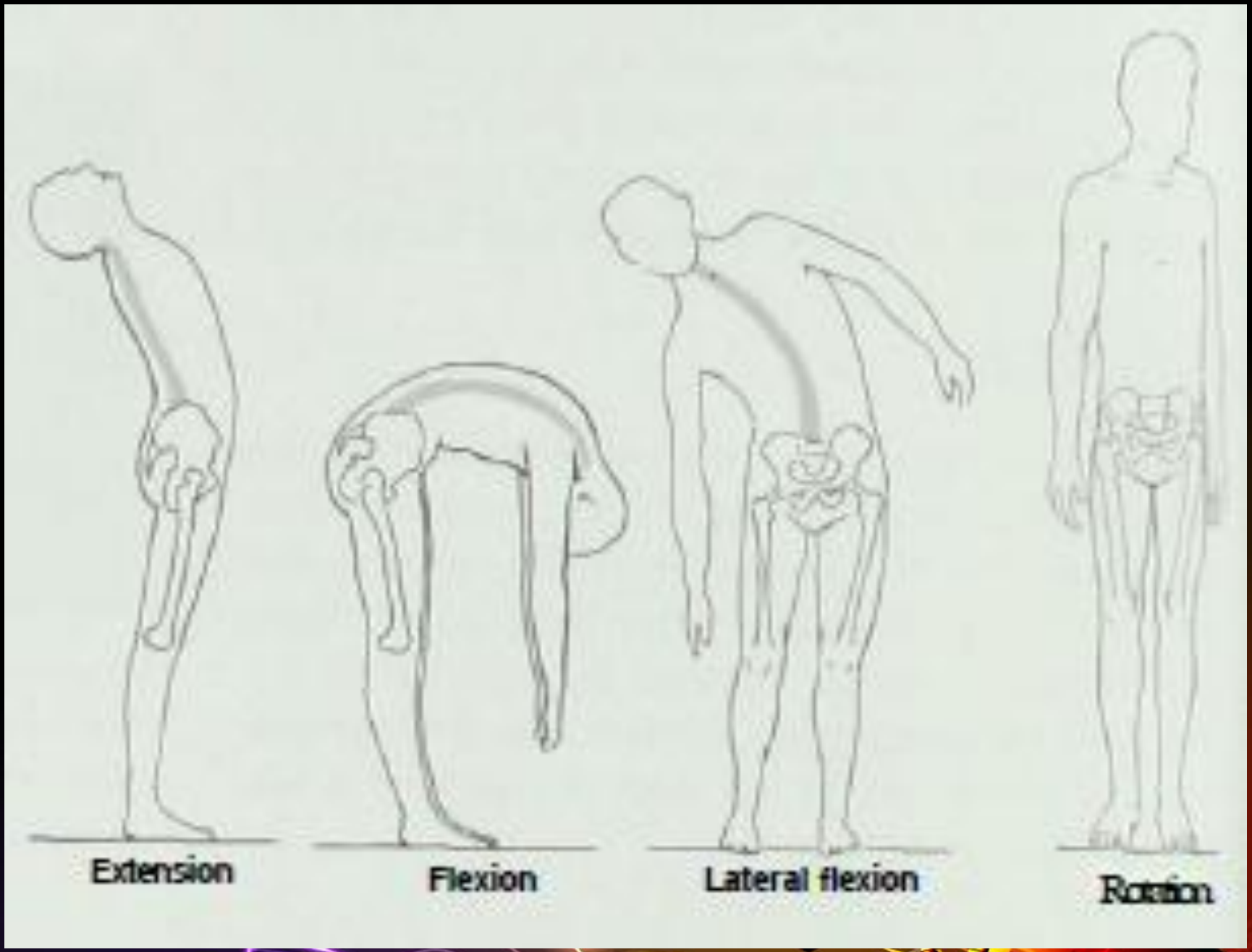
Less-than-average back extension range of motion but normal muscle strength.

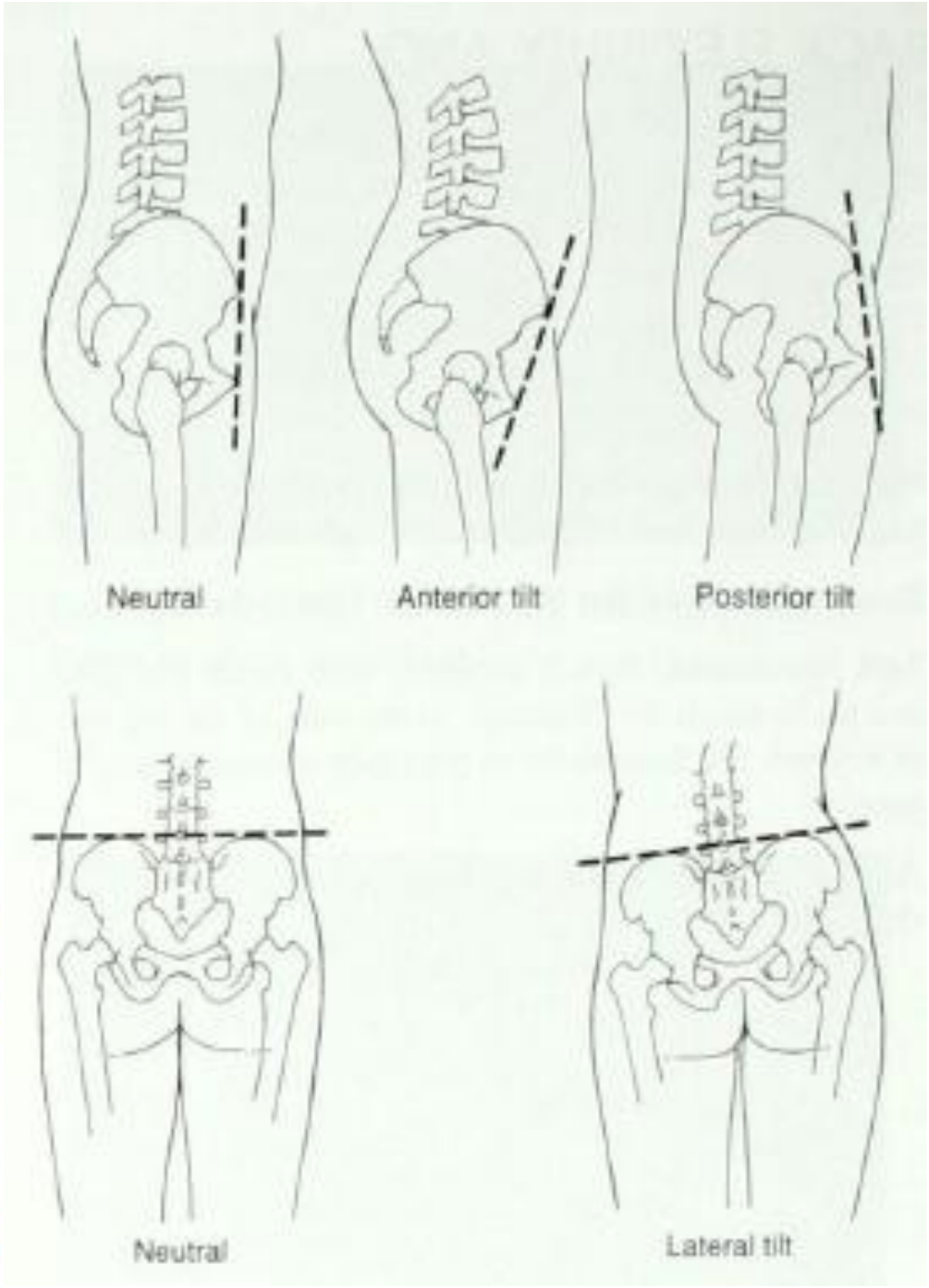


Average back extension range of motion, with anterosuperior-iliac spines in contact with the table.

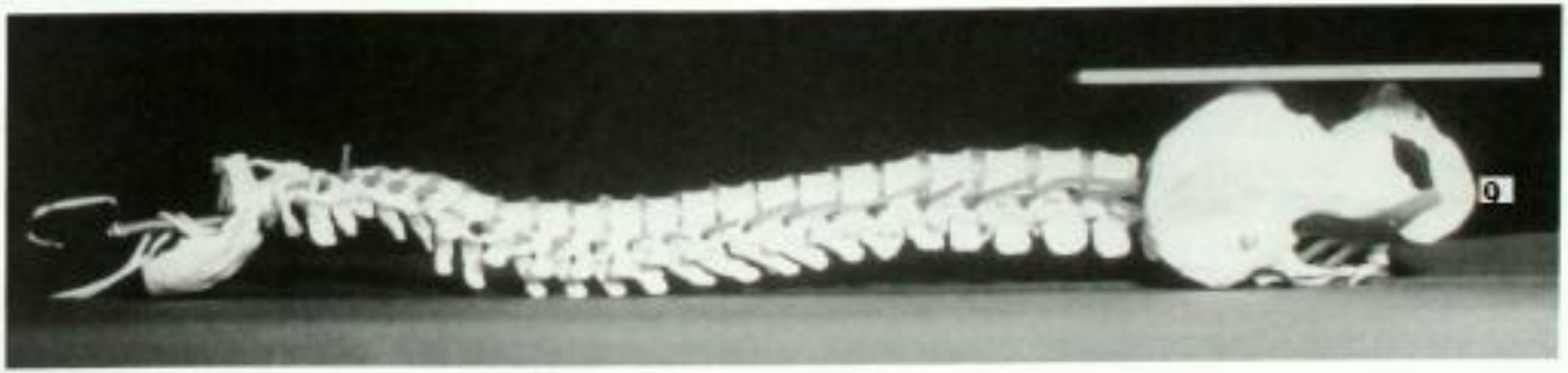
Excessive range of motion in back extension plus hip joint extension that raises the anterosuperior-iliac spines from the table. This subject is a diver and also has excessive flexion of the back. (See p. 175.)

Movements of The Spine and Pelvis

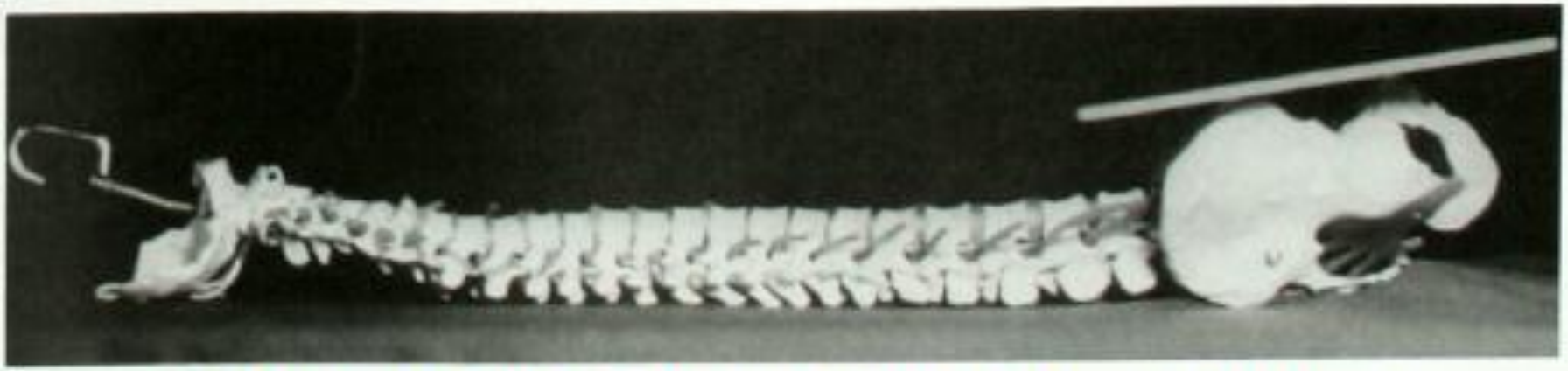

Extension
Flexion
Lateral flexion
Rotation



Movements of The Spine and Pelvis



The pelvis is in the neutral position, and the lumbar spine is in a normal anterior curve.

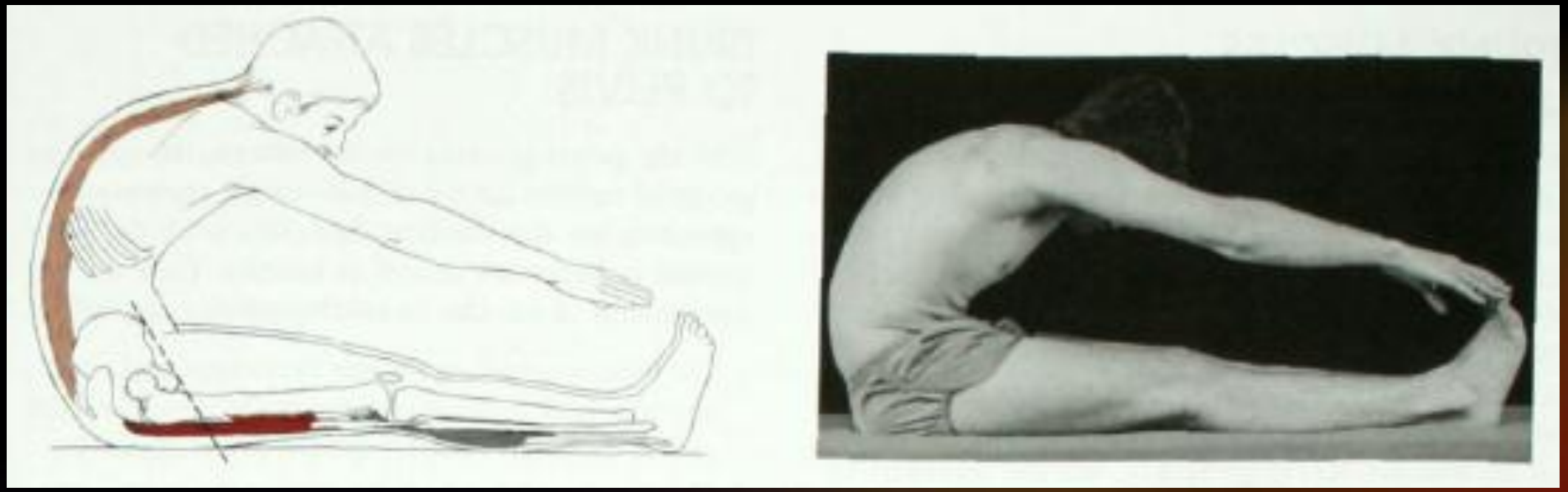


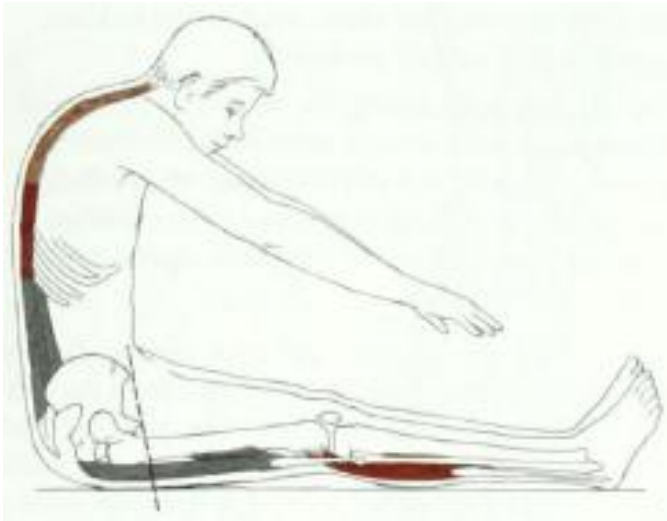
The pelvis is in a posterior tilt of 10°, and the lower back is flat (i.e., normal flexion).

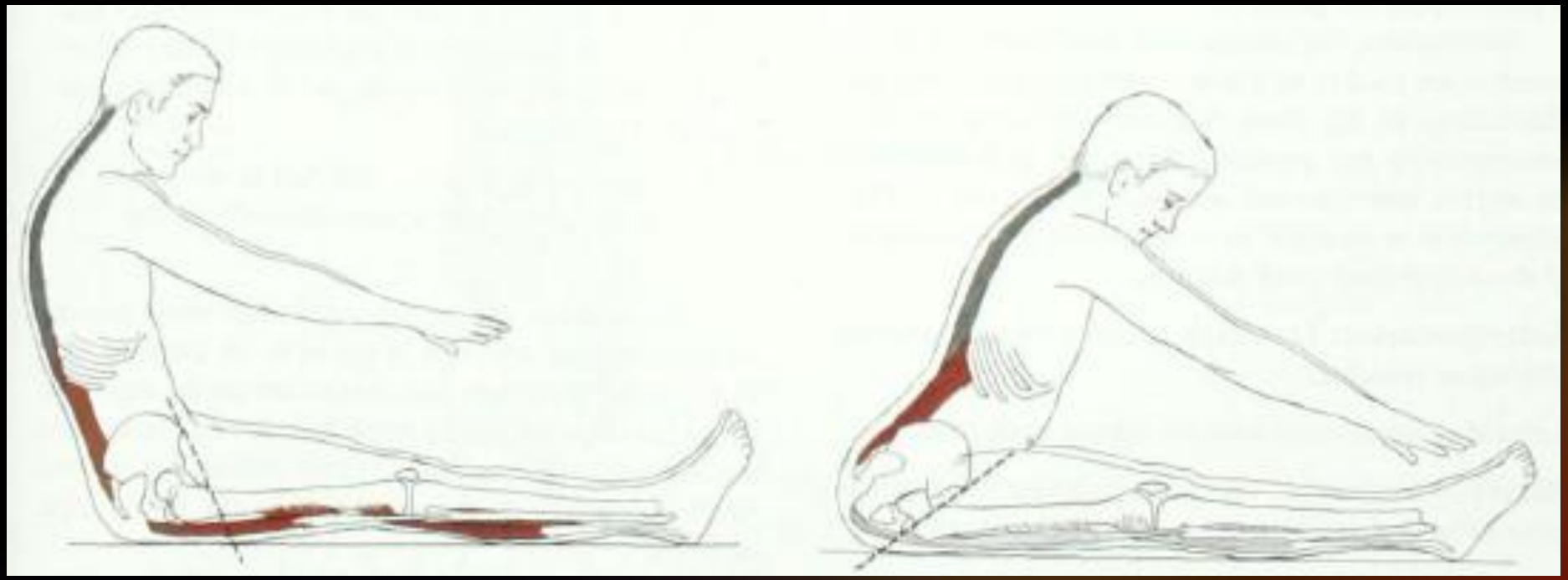
Forward-Bending Test For Length of Posterior Muscles

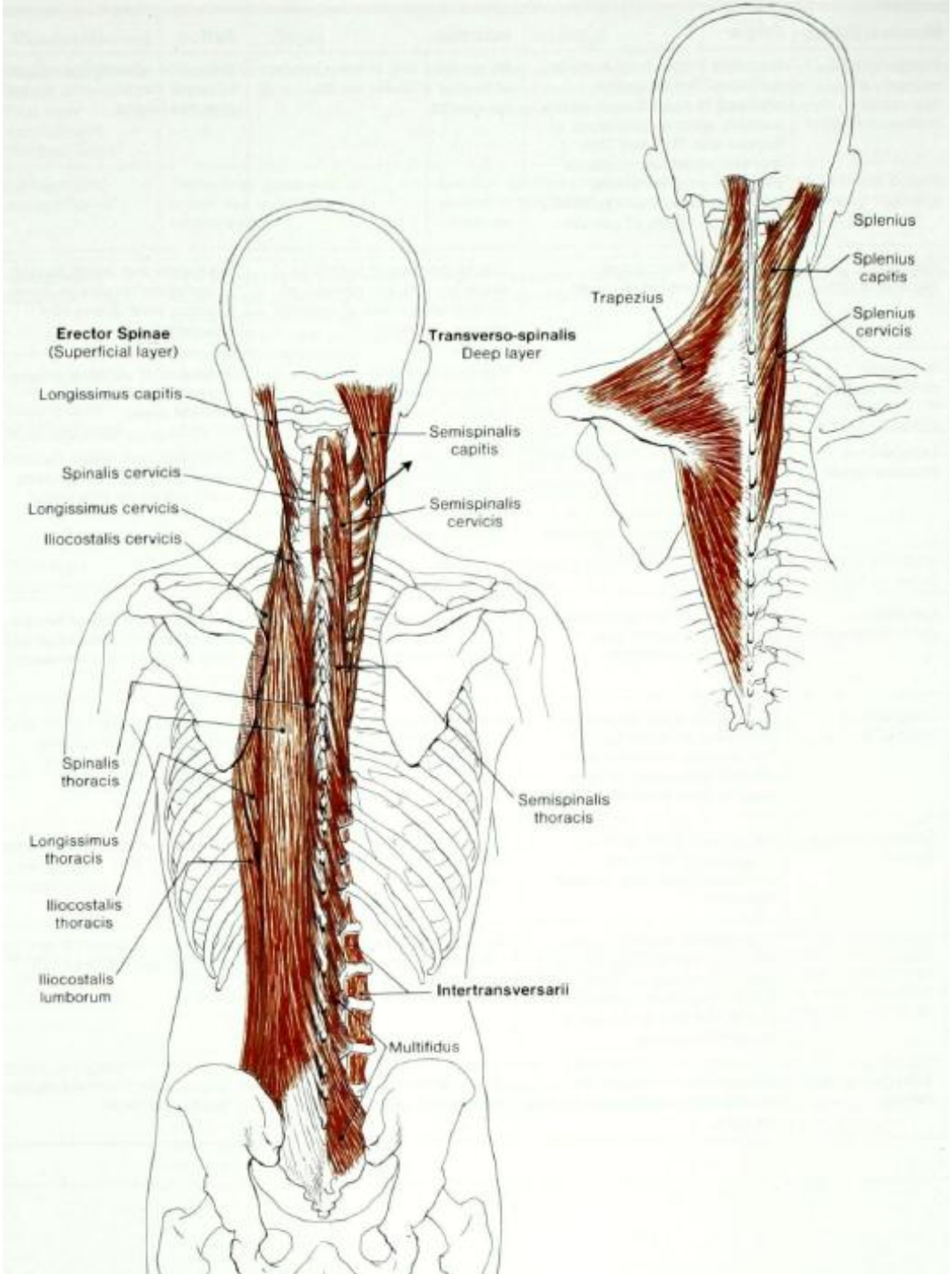
Normal length of back, hamstring, and gastroc-soleus muscles.

Variations In Length of Posterior Muscles



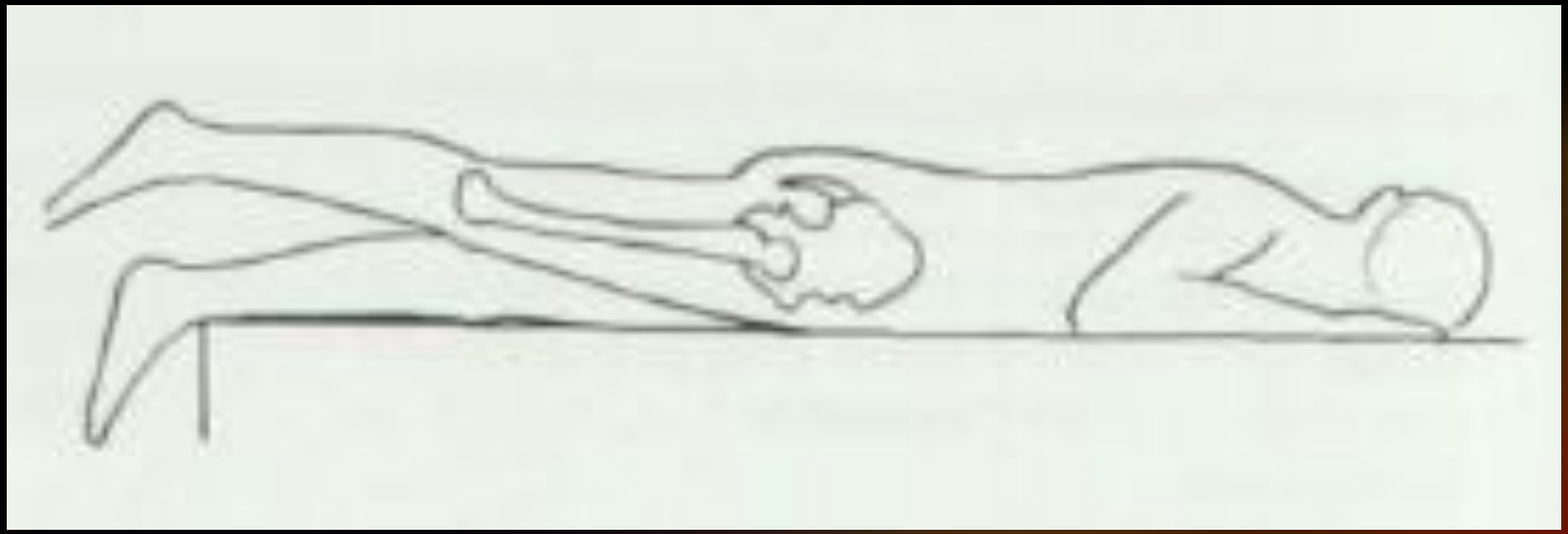


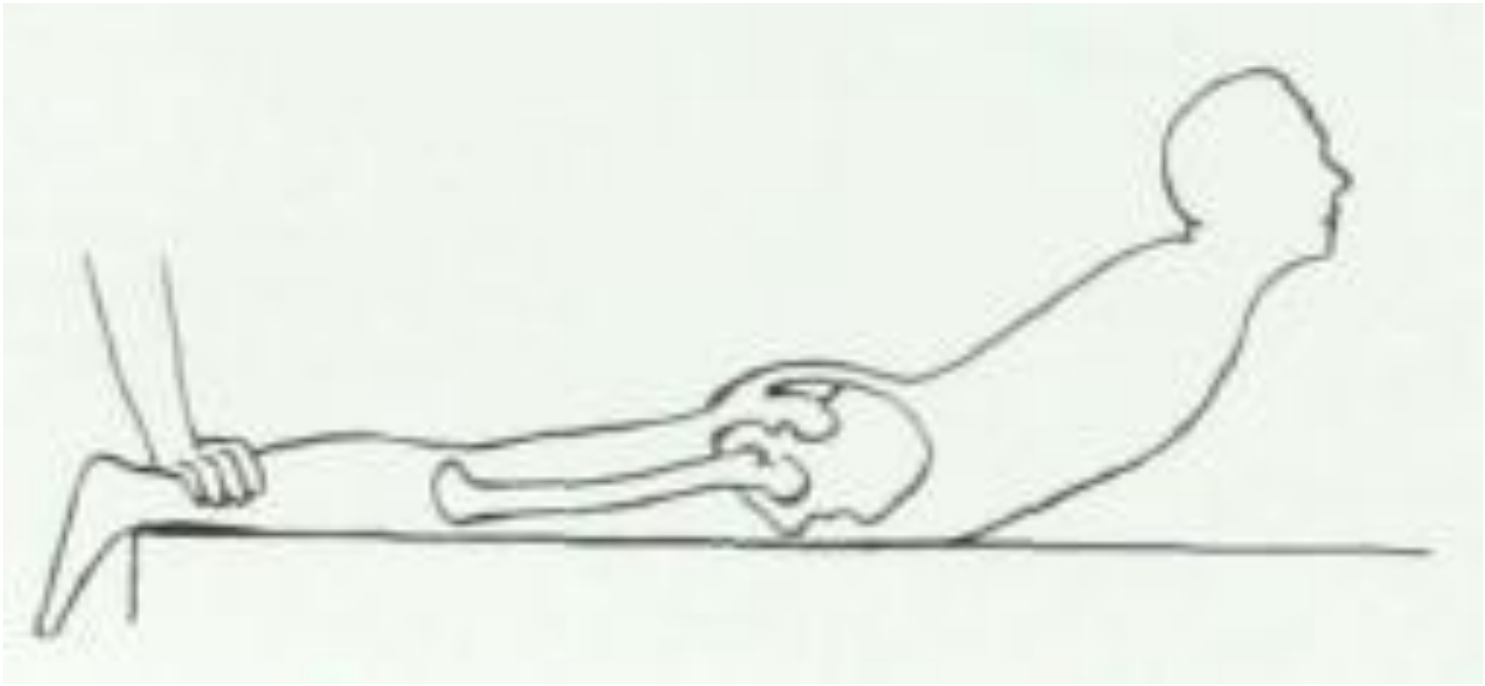


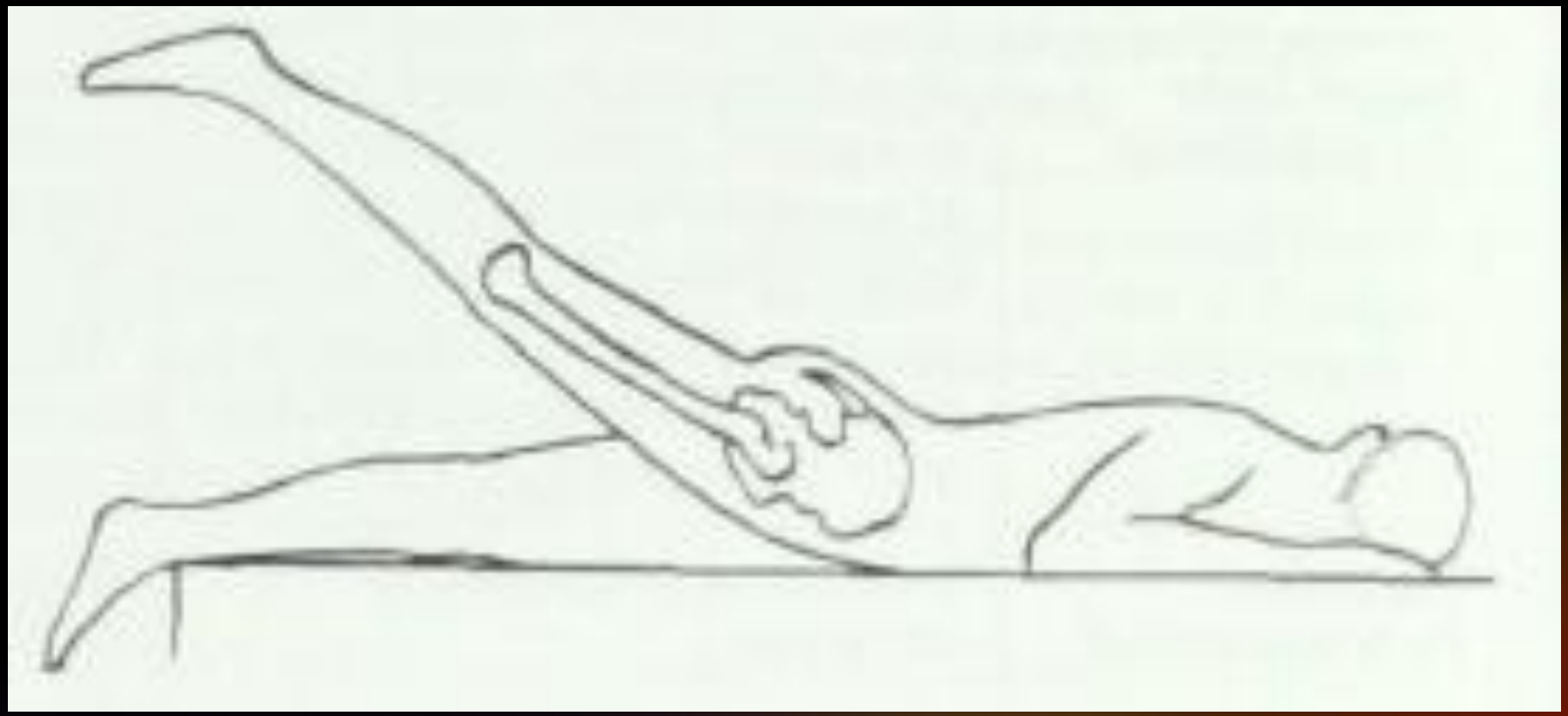


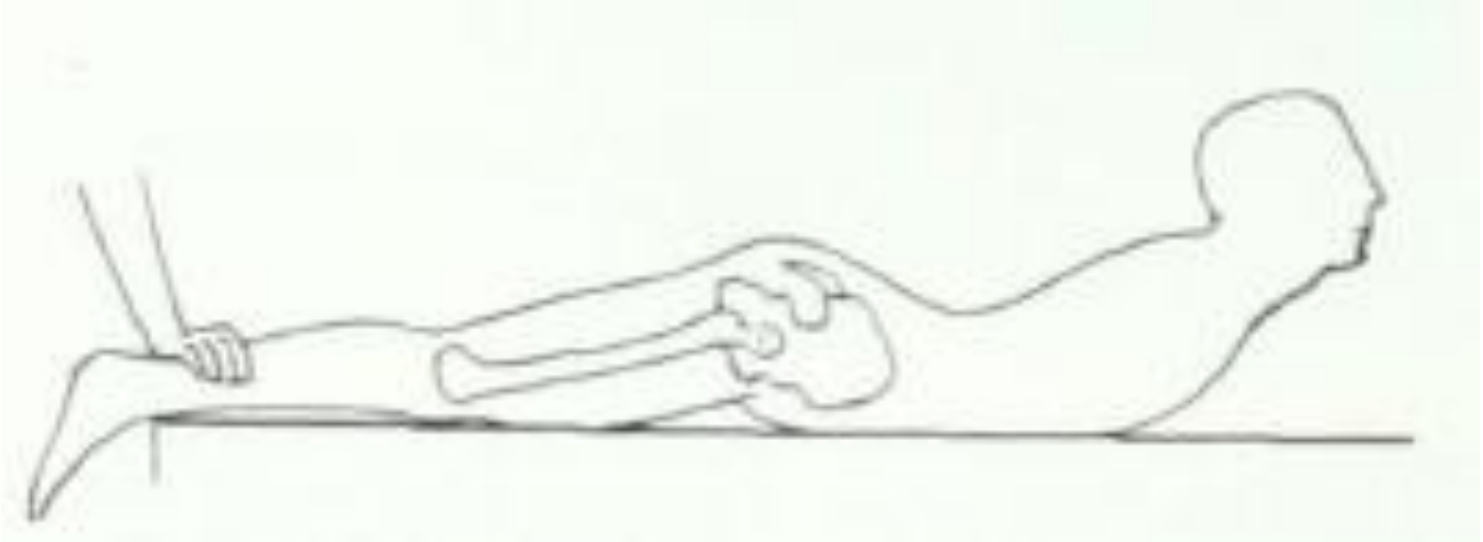
Neck and Back Extensors

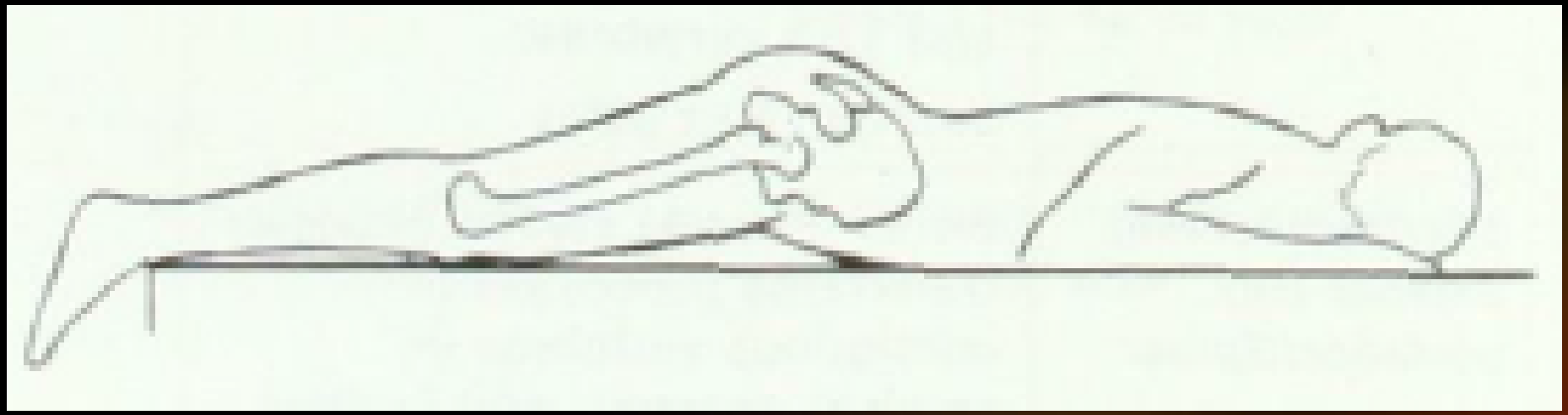
Back And Hip Extensors

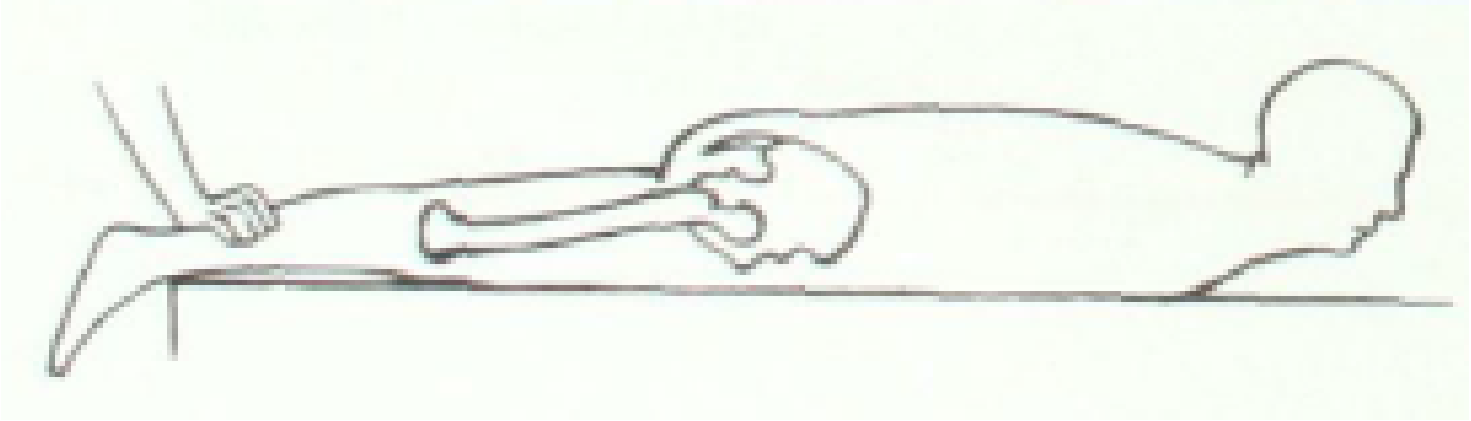


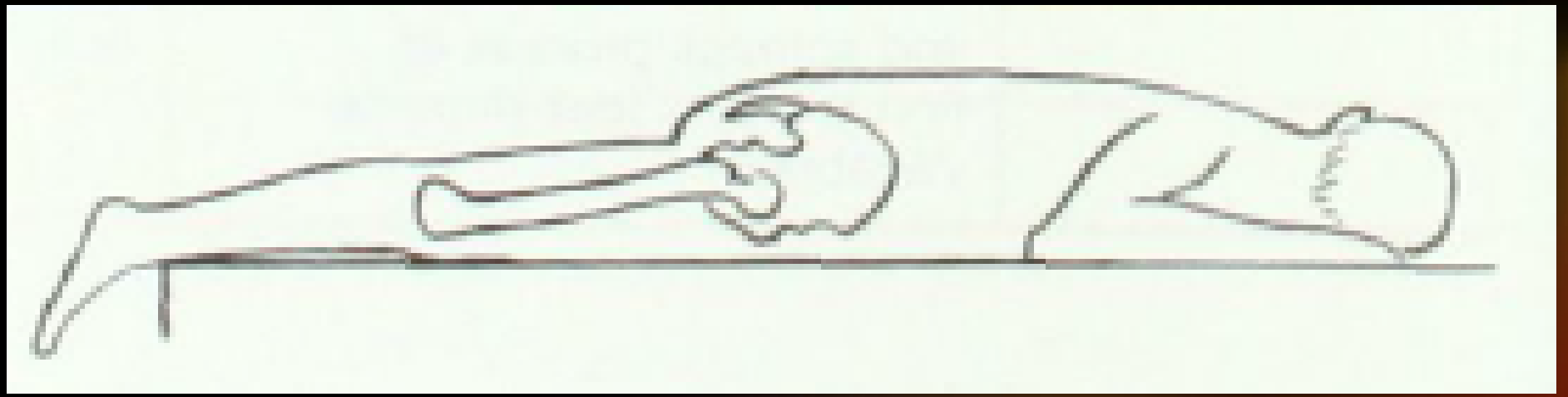




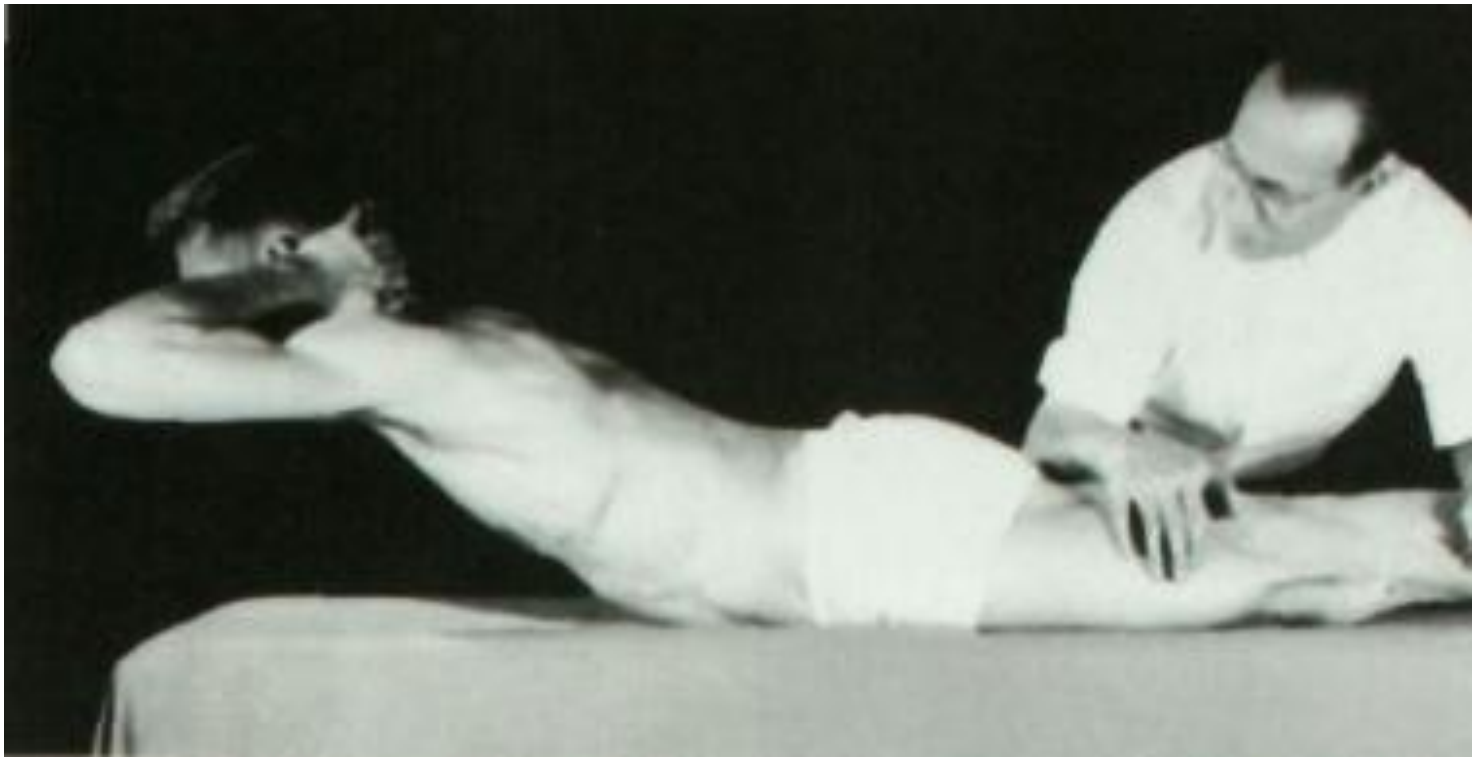




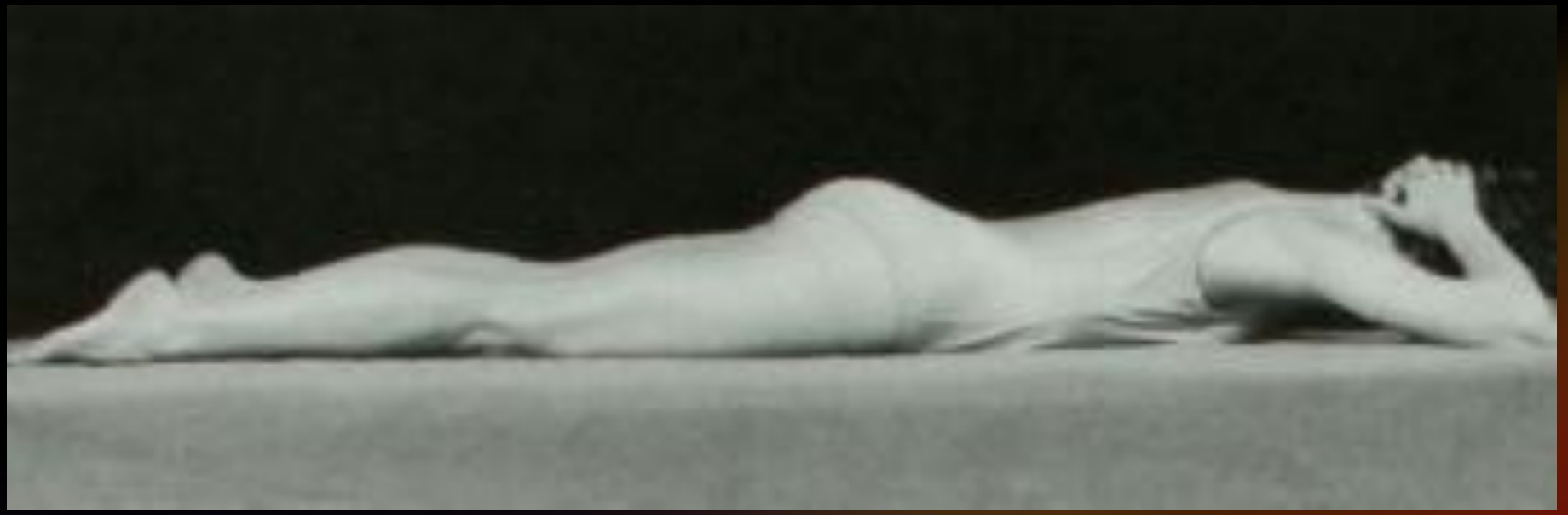




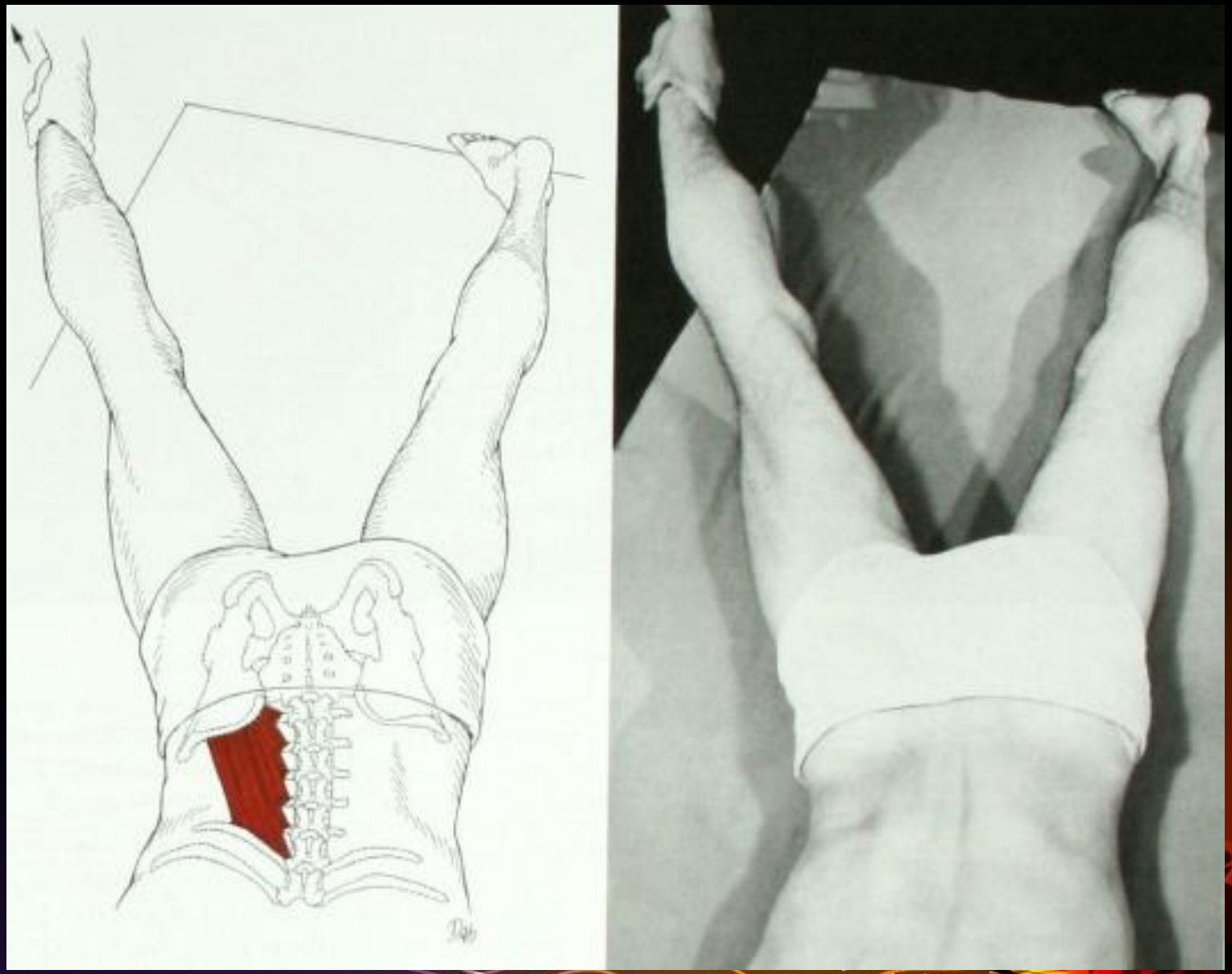
Back Extensors: Testing And Grading



Strong Back Extensors, Misdiagnosed



Quadratus Lumborum



Lateral Trunk Flexor And Hip Abductors

STRONG LATERAL TRUNK MUSCLES AND STRONG HIP ABDUCTOR MUSCLES

Lateral trunk flexion through the subject's full range of motion.

Hip abduction through the subject's full range of motion.

STRONG LATERAL TRUNK MUSCLES AND PARALYZED HIP ABDUCTOR MUSCLES

The subject can laterally flex the trunk, but the underneath shoulder will scarcely be raised from the table. The pelvis will be drawn upward as the head is raised laterally, and the iliac crest and costal margin will be approximated.

In attempting to raise the extremity in abduction, the movement that occurs is elevation of the pelvis by the lateral trunk muscles. The extremity may be drawn upward into the position as illustrated, but the hip joint is not abducted. In fact, the thigh has dropped into a position of adduction and is held there by the joint structure rather than by action of the hip muscles.

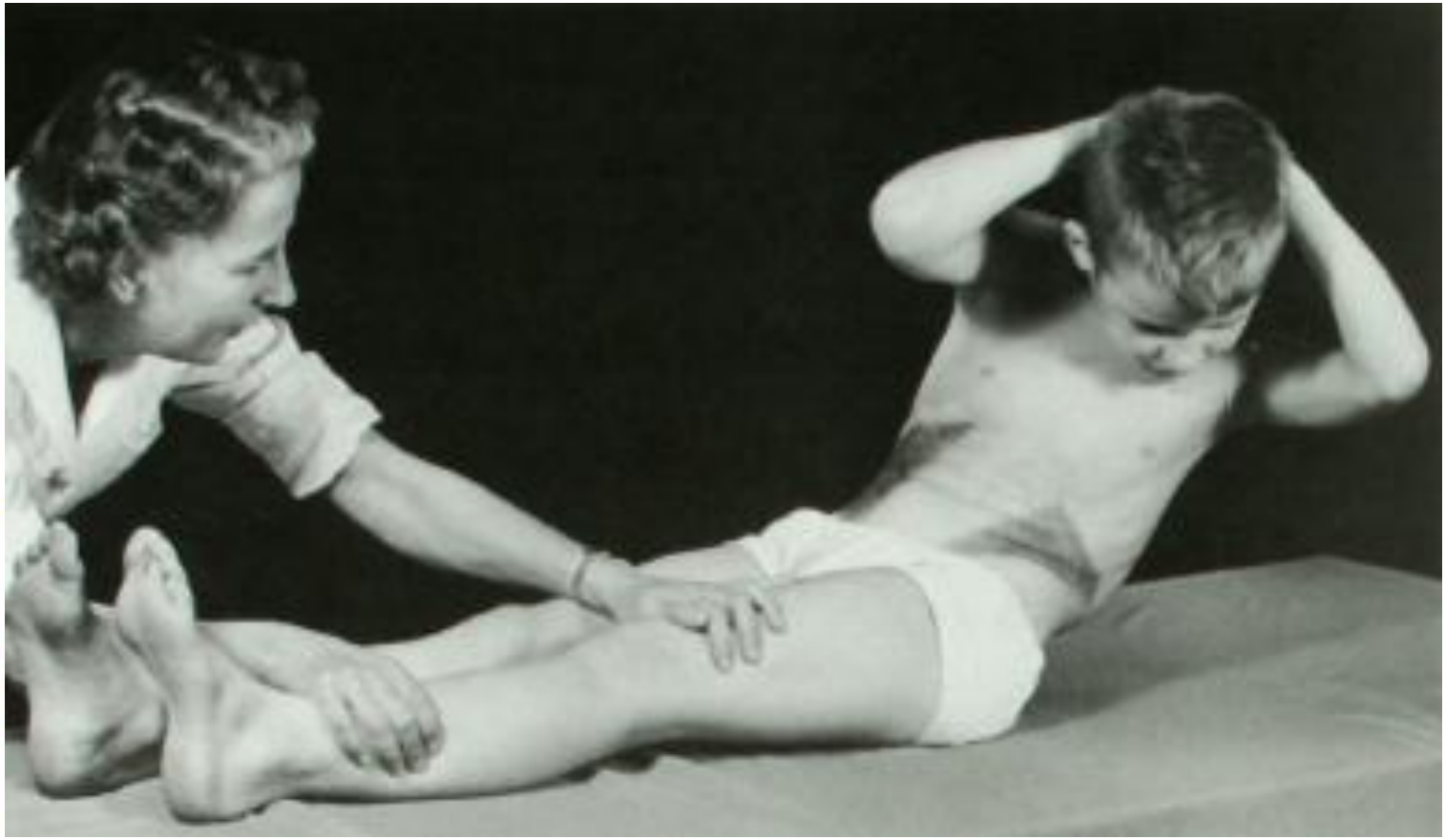
WEAK LATERAL TRUNK MUSCLES AND STRONG HIP ABDUCTOR MUSCLES

The subject cannot raise the trunk in true lateral flexion. Under certain circumstances, the patient may be able to raise the trunk from the table laterally even though the lateral trunk muscles are quite weak. If the trunk can be held rigid, the hip abductor muscles may raise the trunk in abduction on the thigh. The rib cage and iliac crest will not be approximated laterally as they are when the lateral trunk muscles are strong. By decreasing the pressure providing fixation for the hip abductors, the examiner can make it necessary for the lateral abdominals to attempt initiation of the movement.

The extremity can be lifted in hip abduction, but without fixation by the lateral abdominal muscles, it cannot be raised high off the table. Because of the weakness of the lateral trunk muscles, the weight of the extremity tilts the pelvis downward.

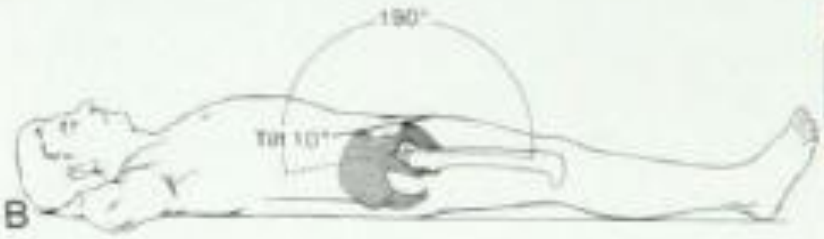
Lateral Trunk Flexors: Testing and Grading

Oblique Trunk Flexors” Testing and Grading

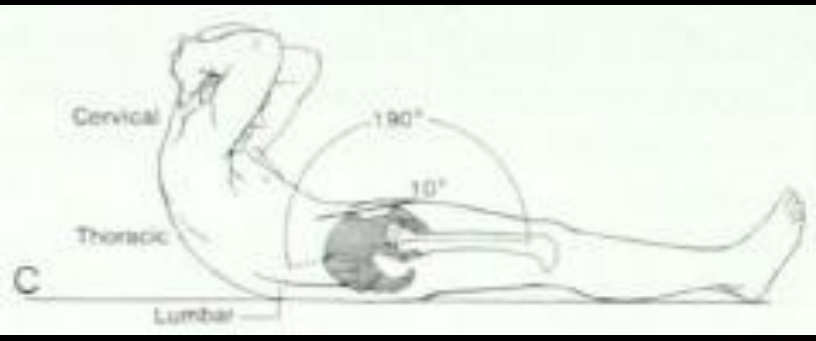


Movements During Curled-Trunk Sit-Ups With Legs Extended

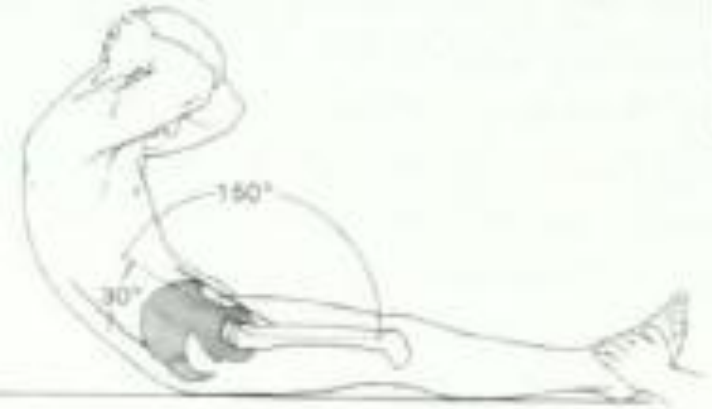
	SPINE			PELVIS	HIP JOINTS	
	Cervical (Neck)	Thoracic (Upper Back)	Lumbar (Low Back)		Anatomical degrees	>meinc "9ree.
A						
	Position: Supine, hands clasped behind head					
	Zero (Normal anterior curve)	Zero (Normal posterior curve)	Zero (Normal anterior curve)	Neutral position	Zero	180



B					
Movement: Posterior pelvic tilt, lumbar spine flexion, and hip joint extens on.					
Zero	Zero	Flexed (straight)	10° posterior tilt	10° exten-sion	190



C					
Movement: Cervical and thoracic spine flexion. Figure C represents completion of spine flexion phase and beginning of hip flexion phase					
Flexed (straight)	Flexed (curled)	Flexed (straight)	10° posterior tilt	10° extension	190°

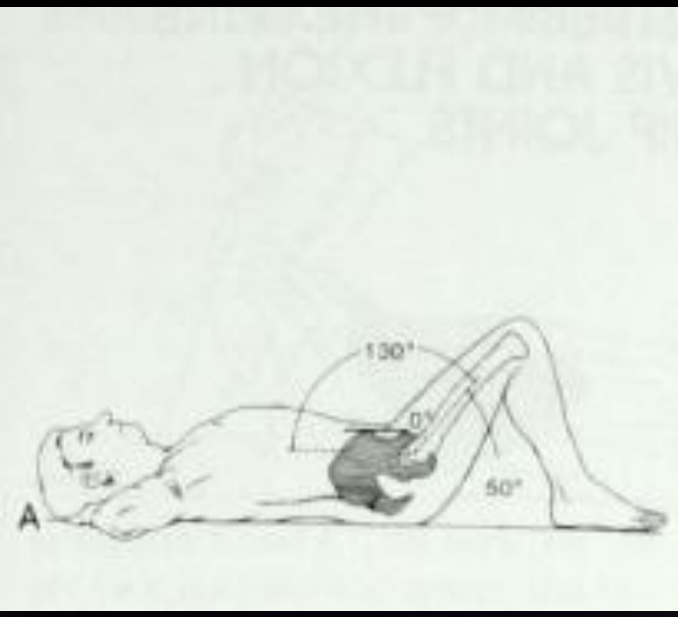


Movement: Hip joint flexion. The hip joint has moved from a 190° angle of flexion to a 150° angle by pelvis flexing toward femur.

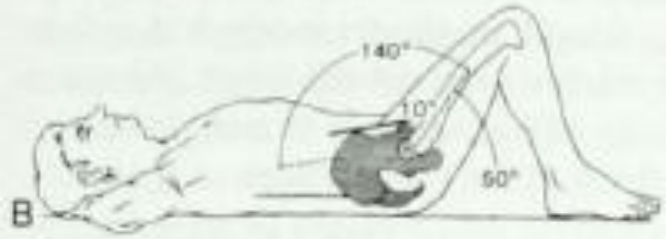
Flexed (straight)	Flexed (curled)	Flexed (straight)	Posterior tilt in relation to trunk Anterior tilt toward thigh	Flexed 30°	180°

E					
Movement: Hip joint flexion, and return toward zero position of cervical and thoracic spines.					
Toward zero	Toward zero	Flexed (straight)	Posterior tilt in relation to trunk Anterior tilt toward thigh	Flexed so°	100°

Movements During Curled-Trunk Sit-Ups With Hips And Knees Flexed

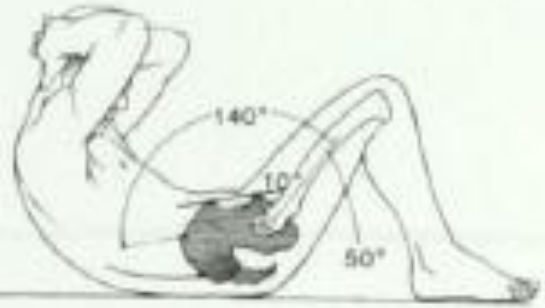


	SPINE			PELVIS	HIP JOINTS	
	Cervical (Neck)	Thoracic (Upper Back)	Lumbar (Low Back)		Anatomical degrees	Geometric degrees
A						
Position: Supine, hands elapsed behind head, knees bent.						
	Zero (Normal anterior curve)	Zero (Normal posterior curve)	Zero (Normal anterior curve)	Neutral position	50°	130°



B

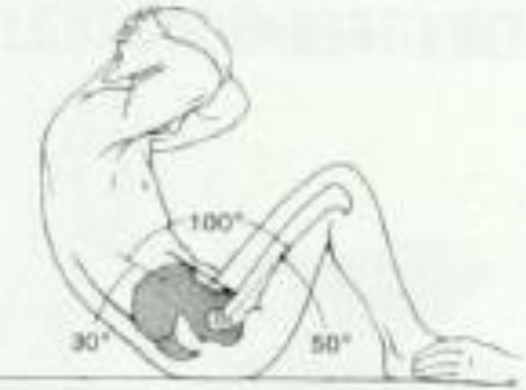
Movement. Lumbar spine flexion and 10° decrease in hip Joint flexion by virtue of posterior pelvic tilt.					
Zero	Zero	Flexed (straight)	10° posterior tilt	50° flexion of thigh	140°



C

Movement. Cervical and thoracic spine flexion. Figure C represents completion of spine flexion and the beginning of the flexion of the pelvis toward flexed thigh.

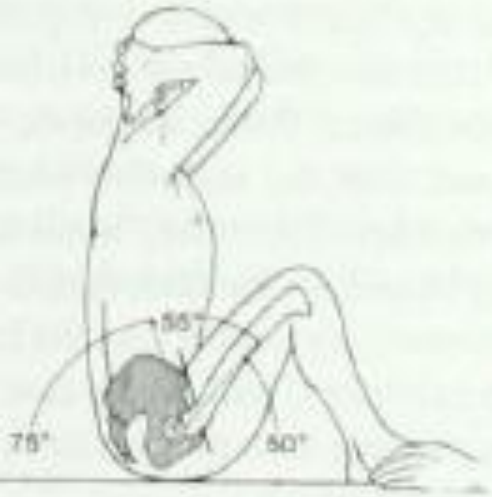
Flexed (straight)	Flexed (curled)	Flexed (straight)	10° posterior tilt	50° flexion of thigh	140°



D

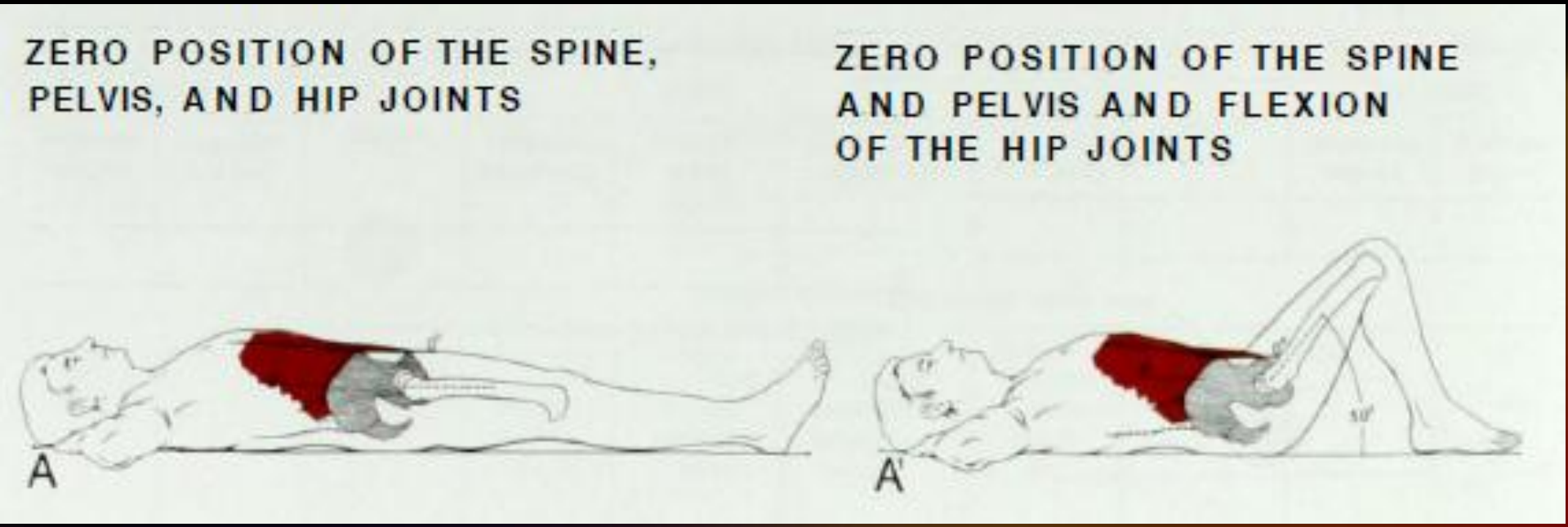
Movement: Hip joint flexion. The hip joint has moved from a 140° angle of flexion to a 100° angle by the pelvis flexing toward the femur.

Flexed (straight)	Flexed (curled)	Flexed (straight)	Posterior tilt in relation to trunk Anterior tilt toward thigh	80° (50° thigh + 30° pelvis)	100°

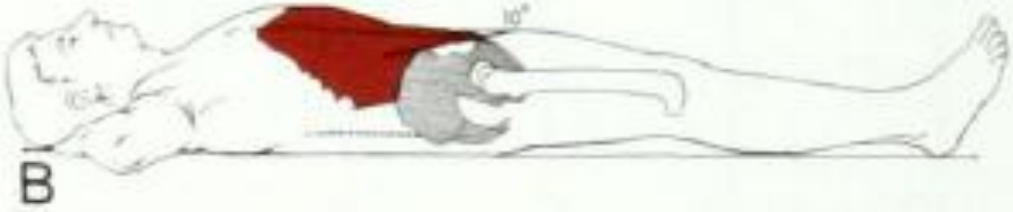


E					
Movement: Hip joint flexion, and a return toward zero position of the cervical and thoracic spines. On the basis of 125° being complete flexion, hip joint has reached the position of complete flexion.					
Toward zero	Toward zero	Flexed (straight)	Posterior tilt in relation to trunk Anterior tilt toward thigh	125° (50° thigh + 75° pelvis)	55°

Abdominal And Hip Flexor Muscles During Curled-Trunk Sit-Ups



POSTERIOR PELVIC TILT,
LUMBAR SPINE FLEXION,
AND HIP JOINT EXTENSION



B

POSTERIOR PELVIC TILT,
LUMBAR SPINE FLEXION,
AND HIP JOINT FLEXION

B'

SPINE FLEXION PHASE (TRUNK-CURL) COMPLETED

C

C'

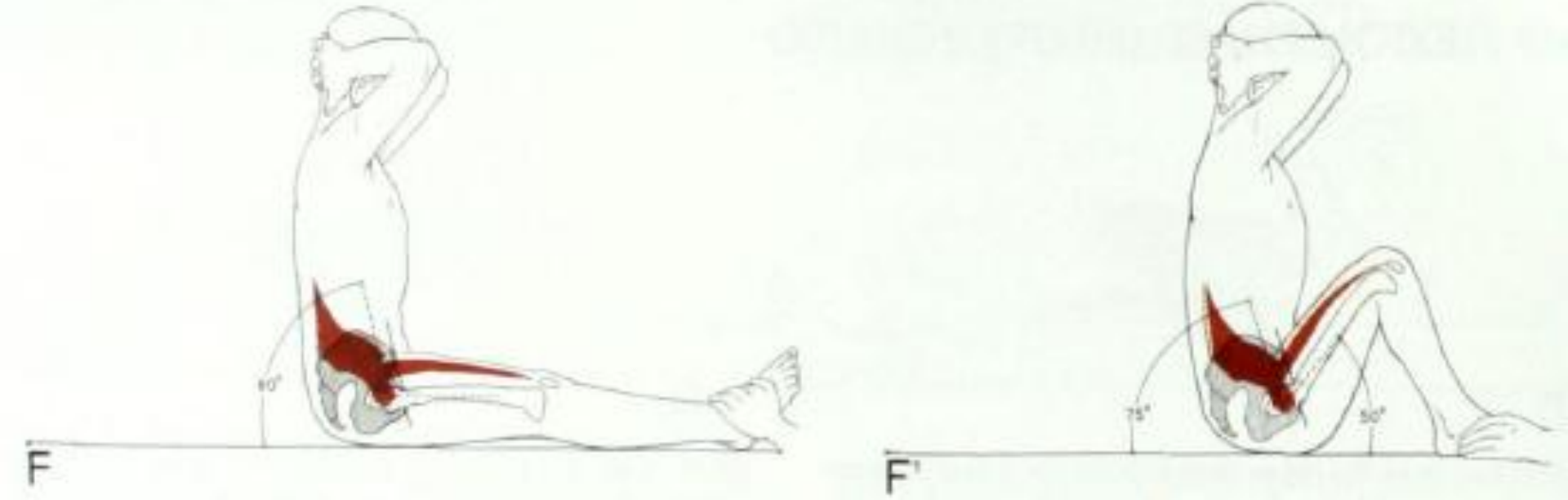
HIP FLEXION PHASE (SIT-UP) INITIATED

D

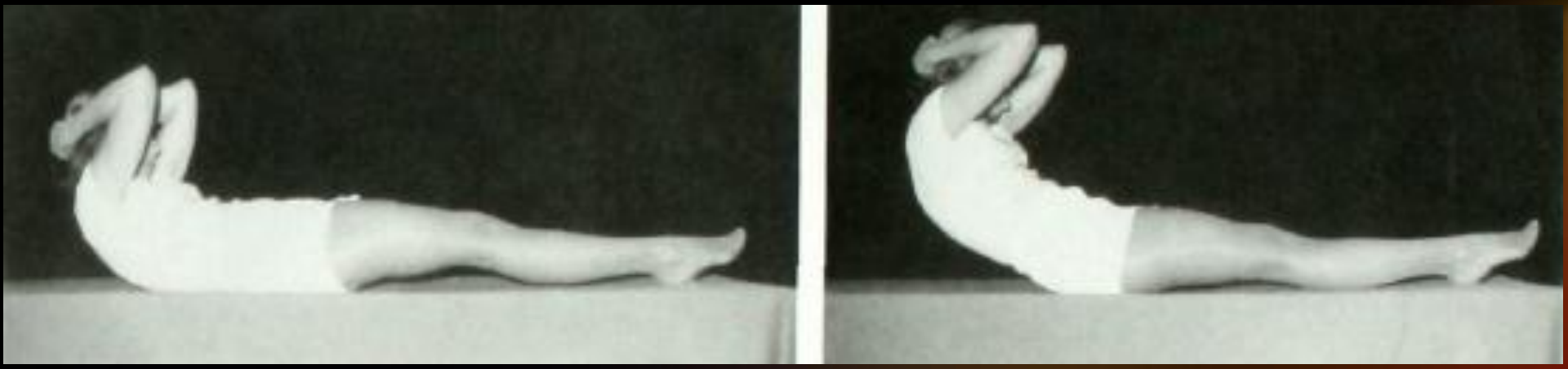
D'

HIP FLEXION PHASE (SIT-UP) CONTINUED

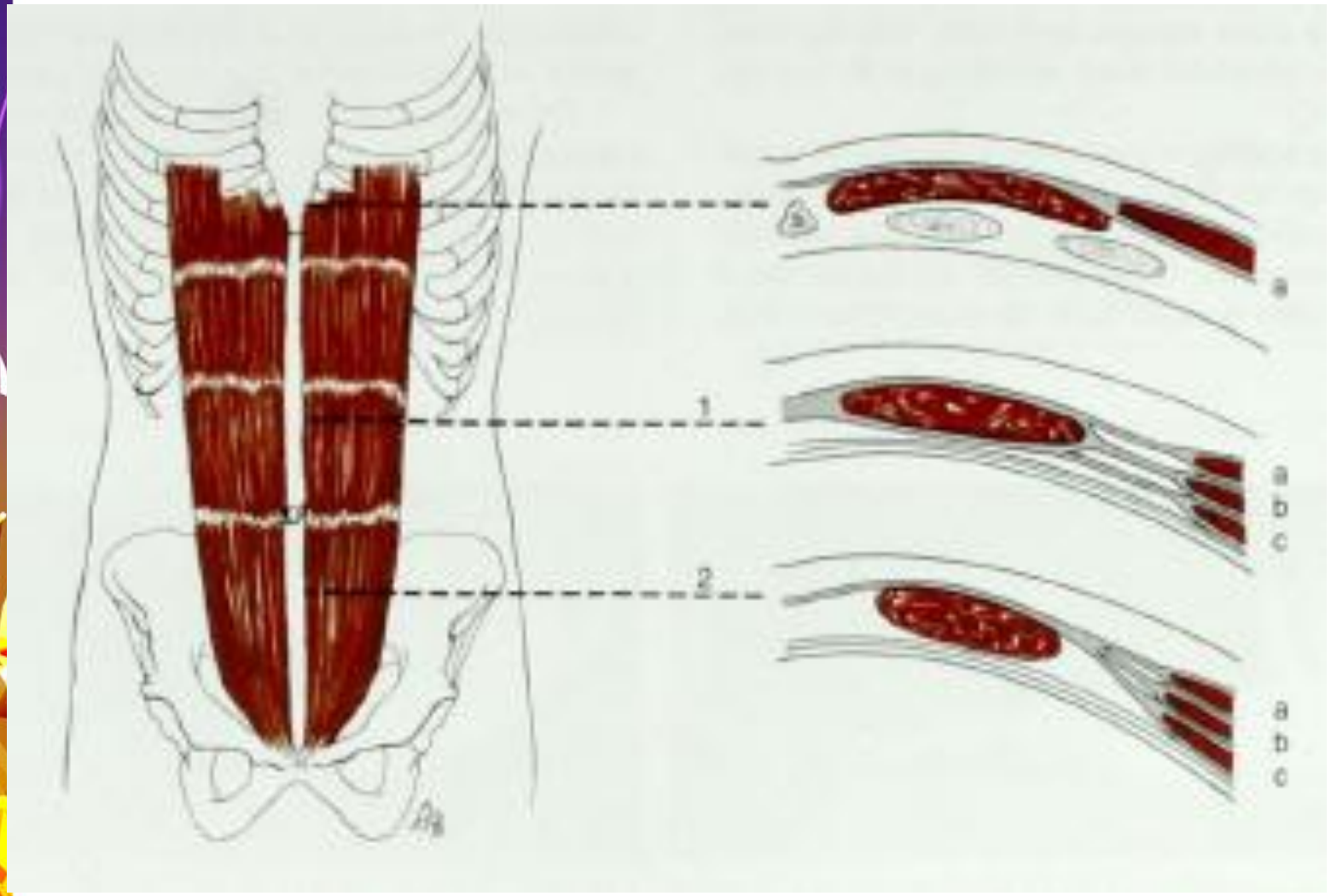
HIP FLEXION PHASE (SIT-UP) COMPLETED

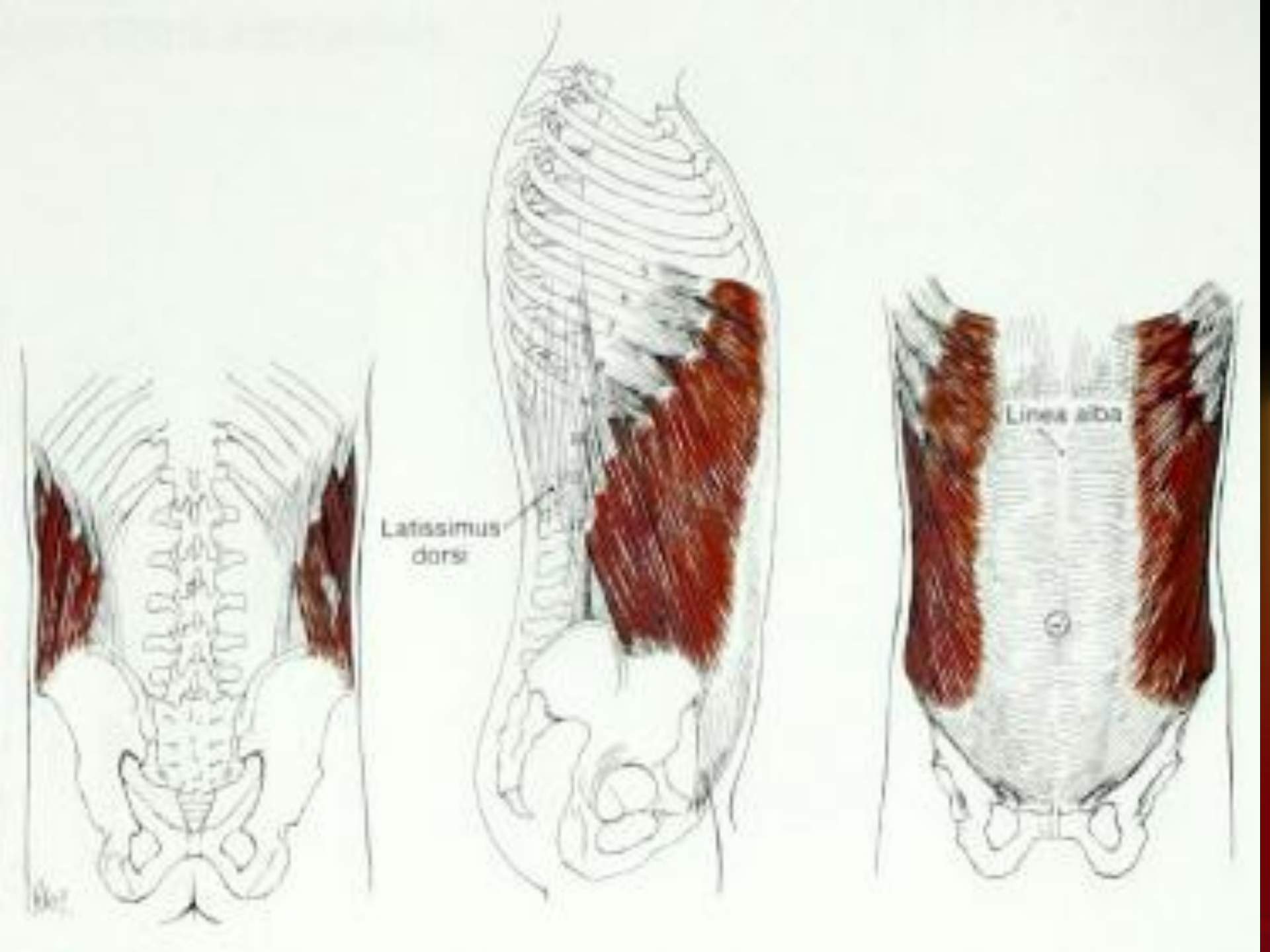


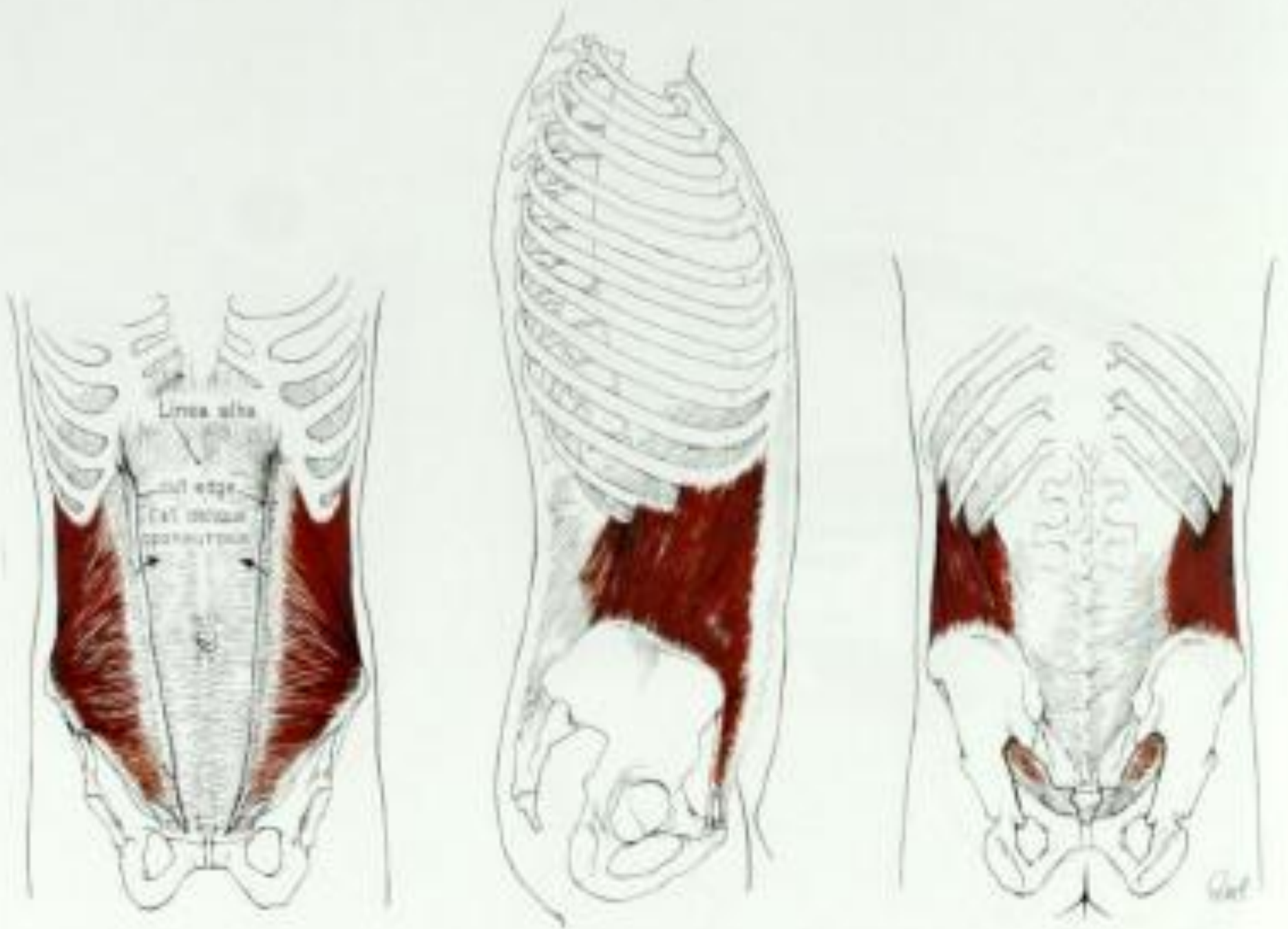
Definitions And Descriptions of Trunk Movements



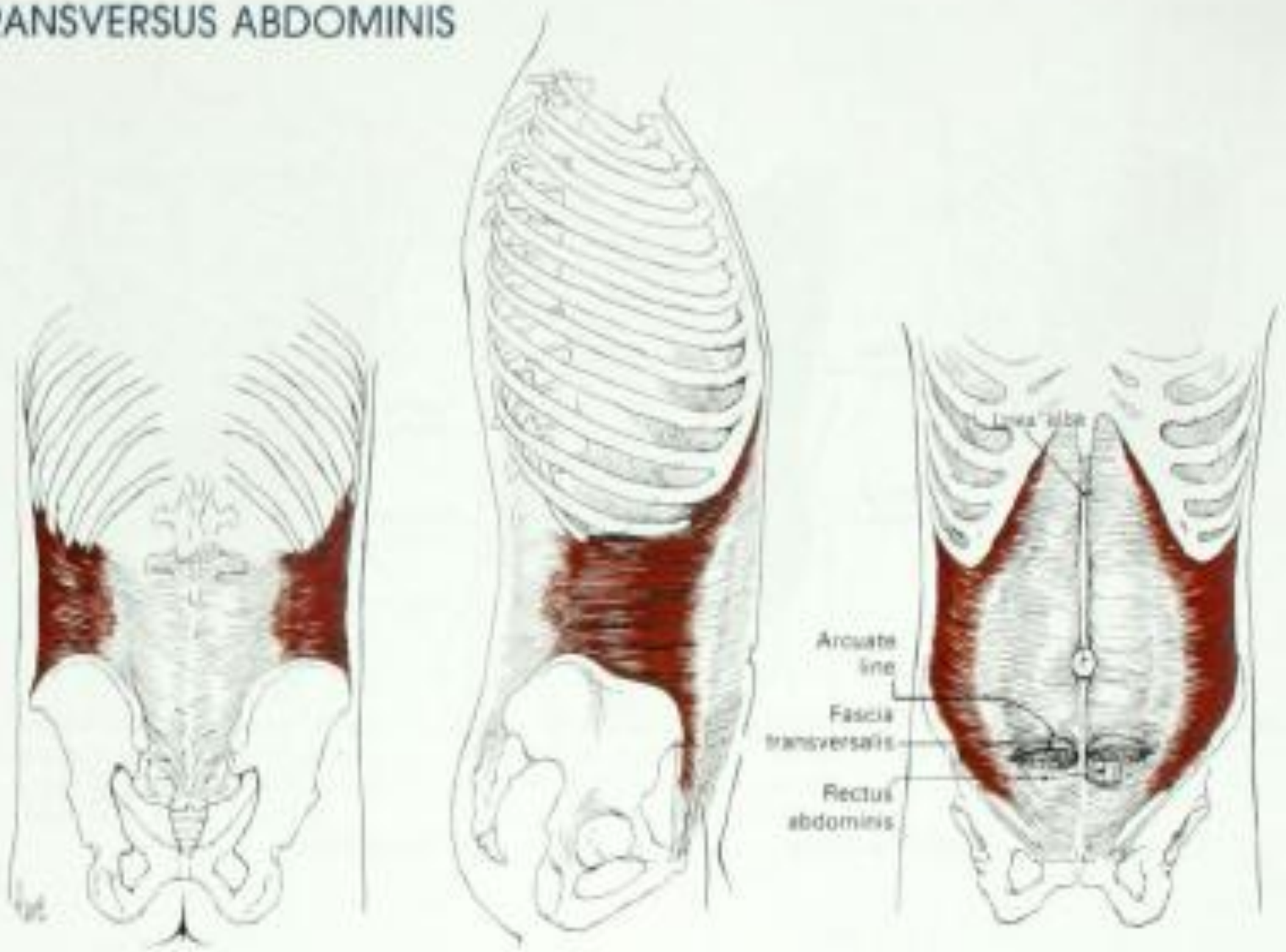
Rectus Abdominis

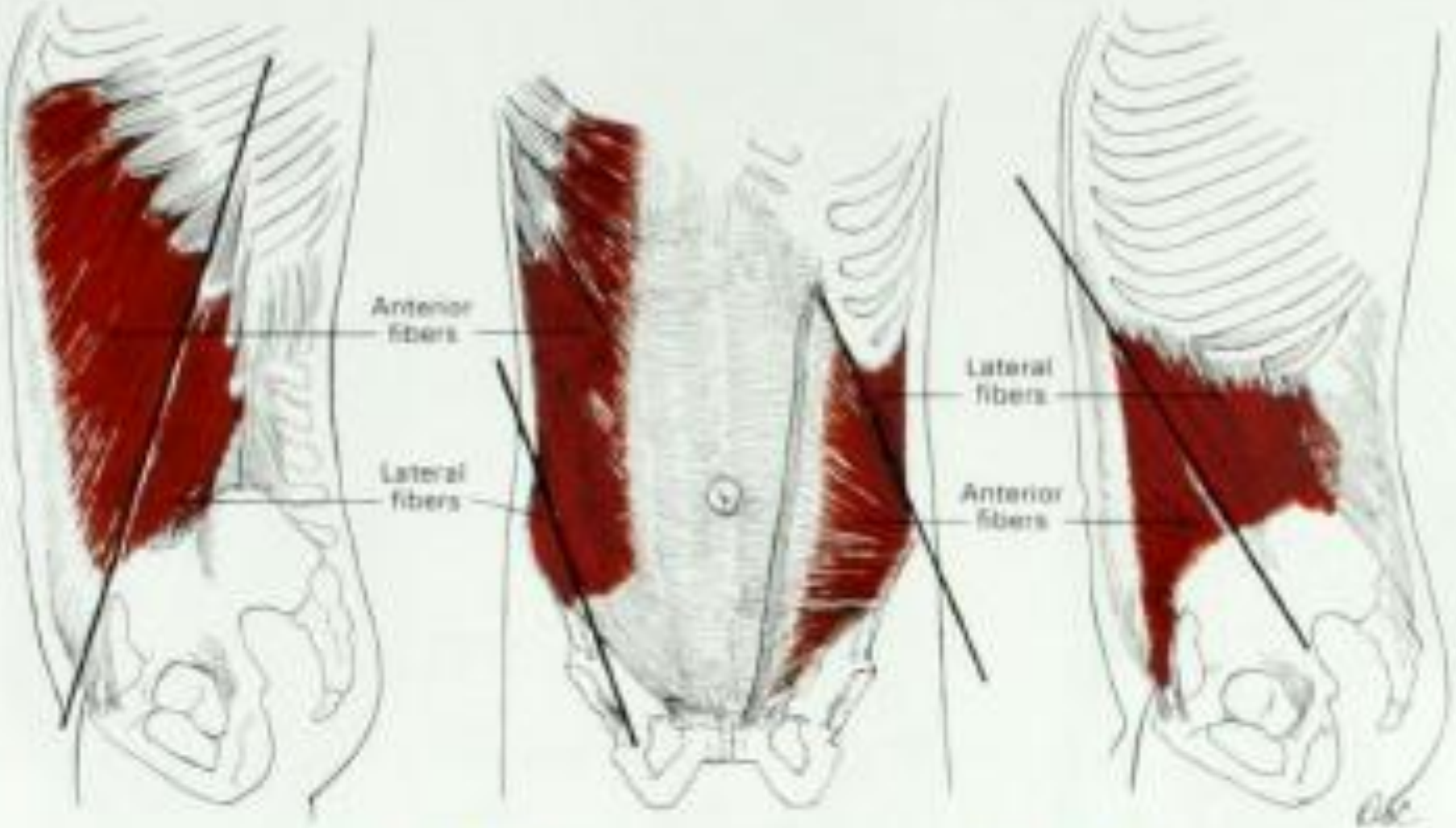


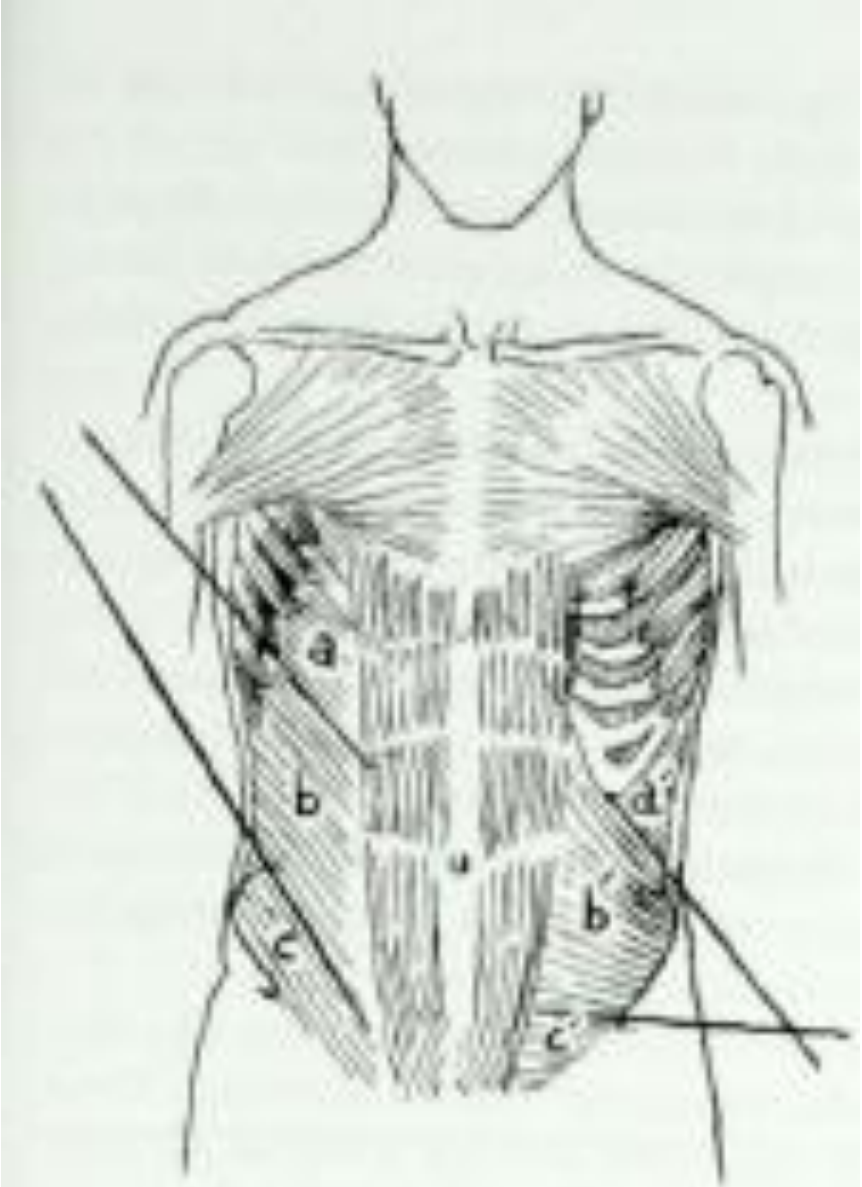

Latissimus dorsi
Linea alba


Linea alba

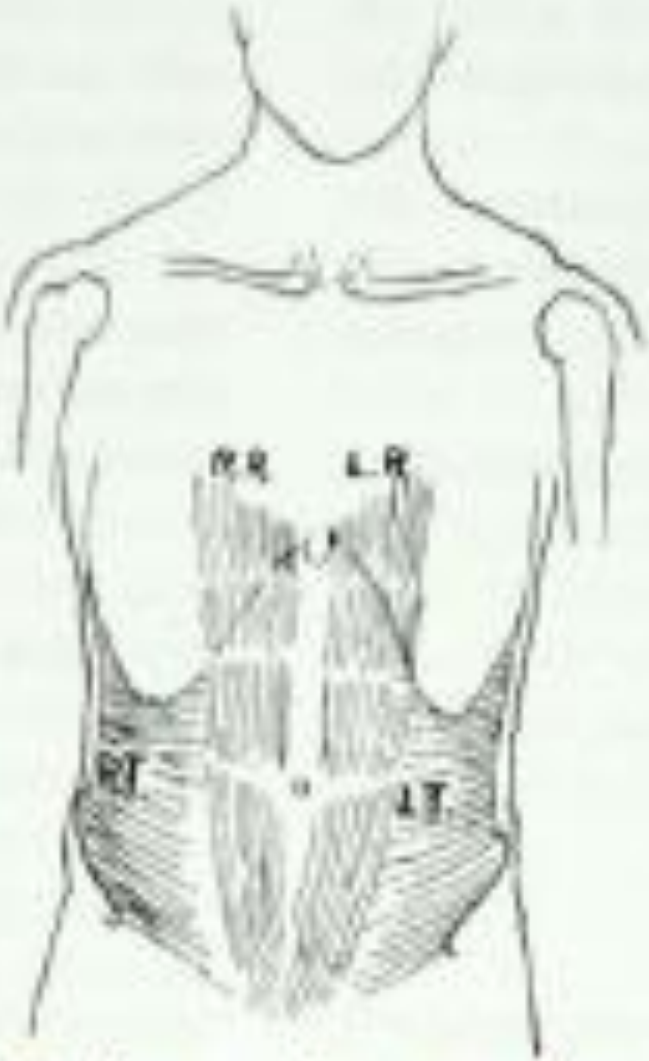
TRANSVERSUS ABDOMINIS



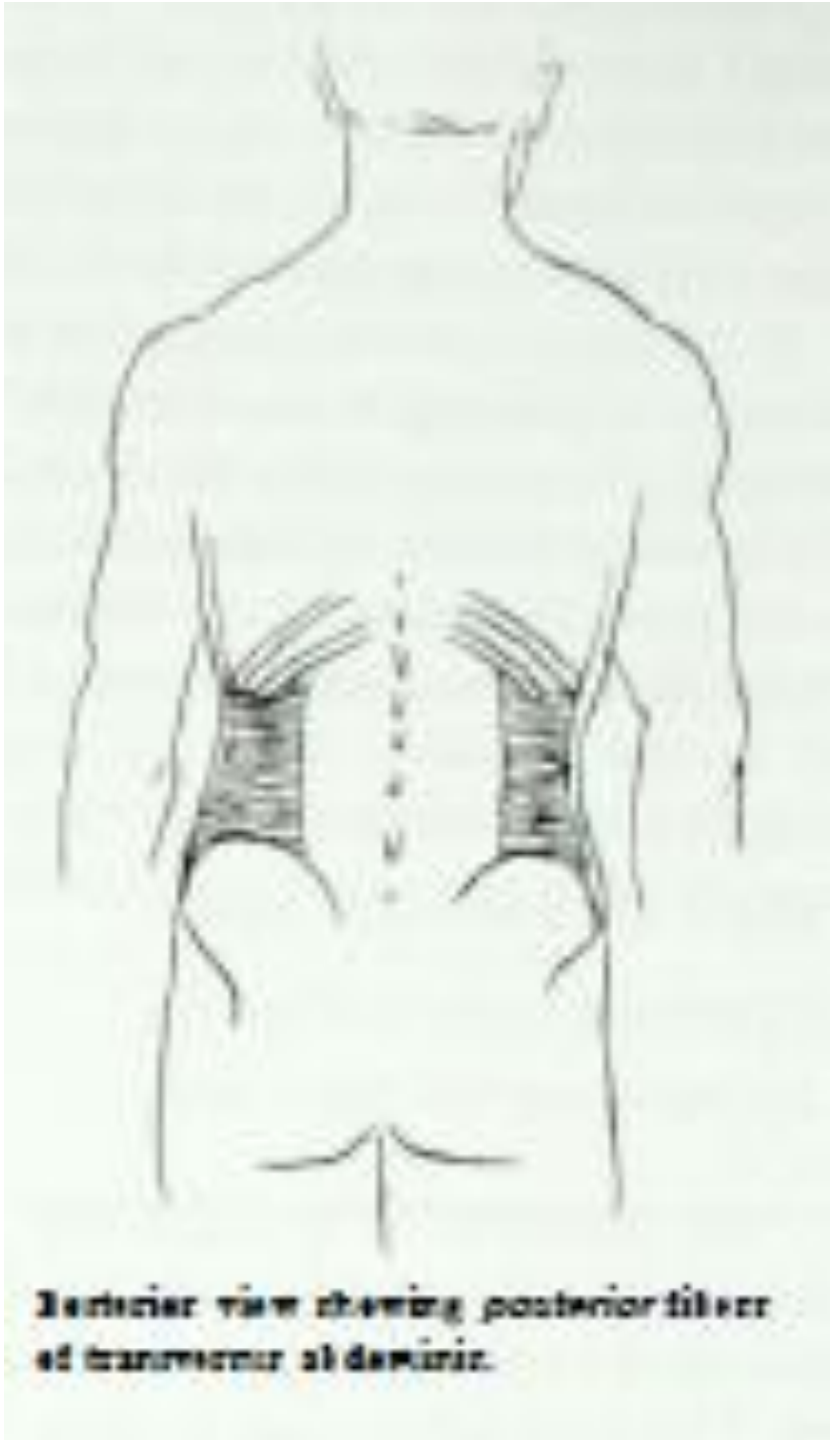

Anterior fibers
Lateral fibers
Lateral fibers
Anterior fibers
External Oblique
Internal Oblique



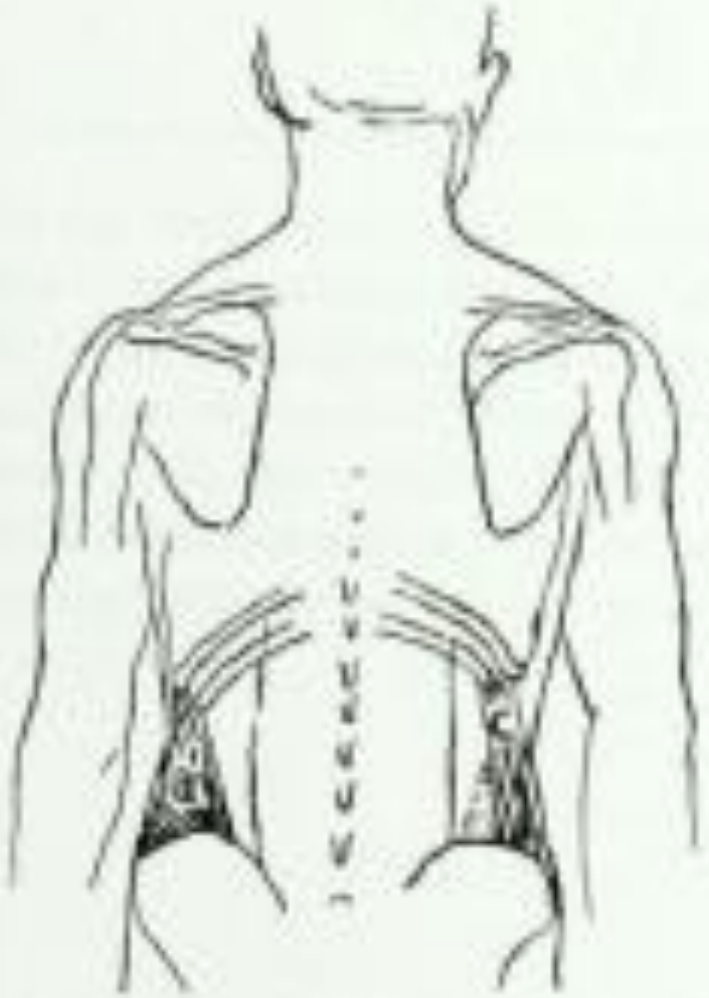
Anterior view of abdomen showing division of right external oblique into a, b, and c portions and left internal oblique into a', b', and c' portions.



Anterior view showing left and right portions (L. R. and R. R.) of rectus abdominis, and left and right portions (L. T. and R. T.) of transversus abdominis.

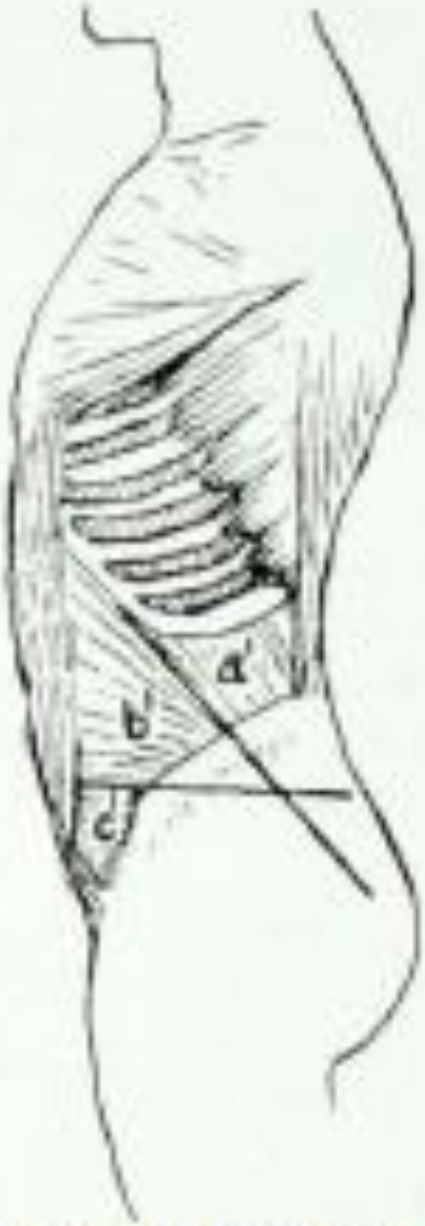


Posterior view showing posterior fibers of transversus abdominis.



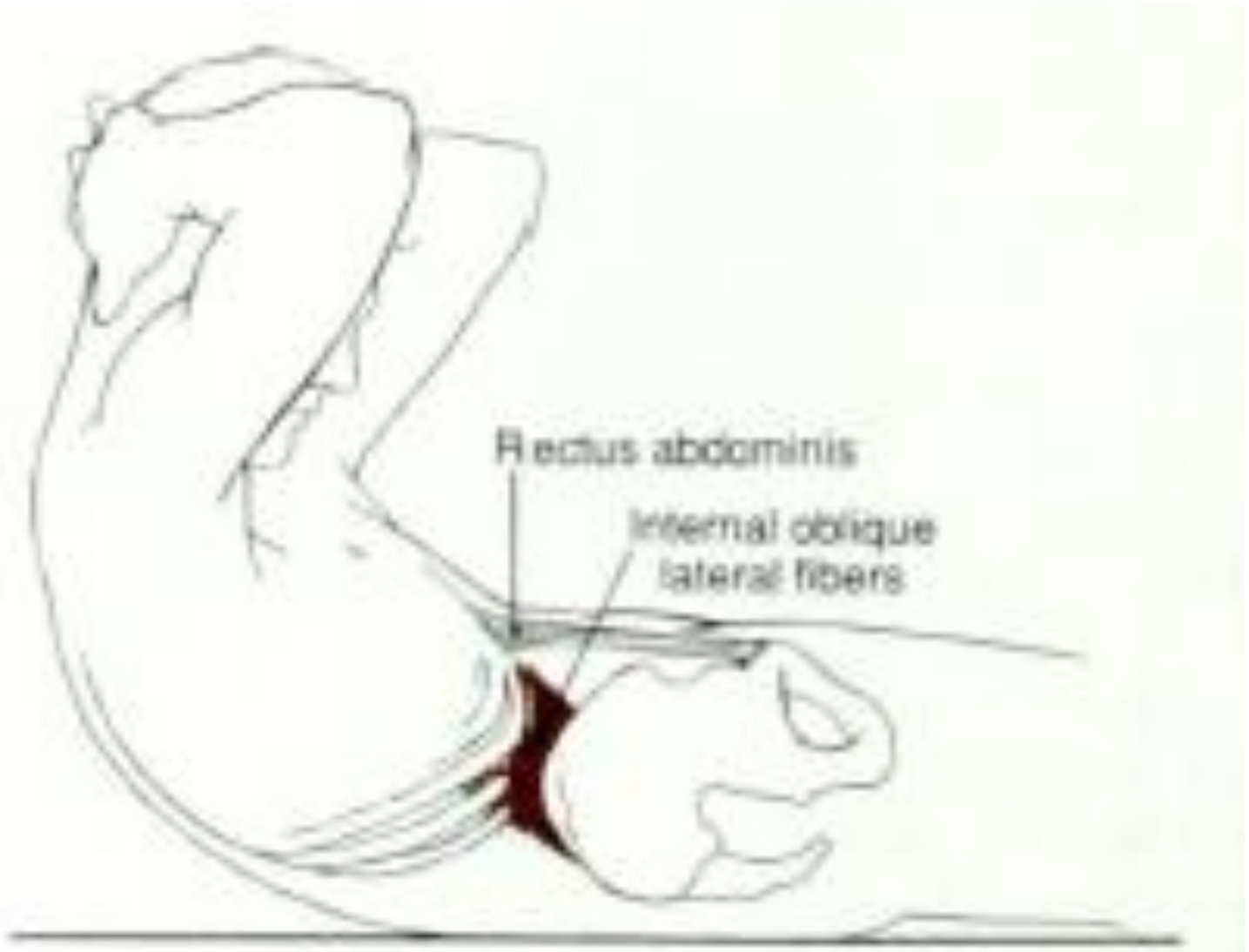
Posterior view showing posterior fibers of left internal oblique, a, and right external oblique c.

Lateral view of left external oblique showing a, b, and c portions.

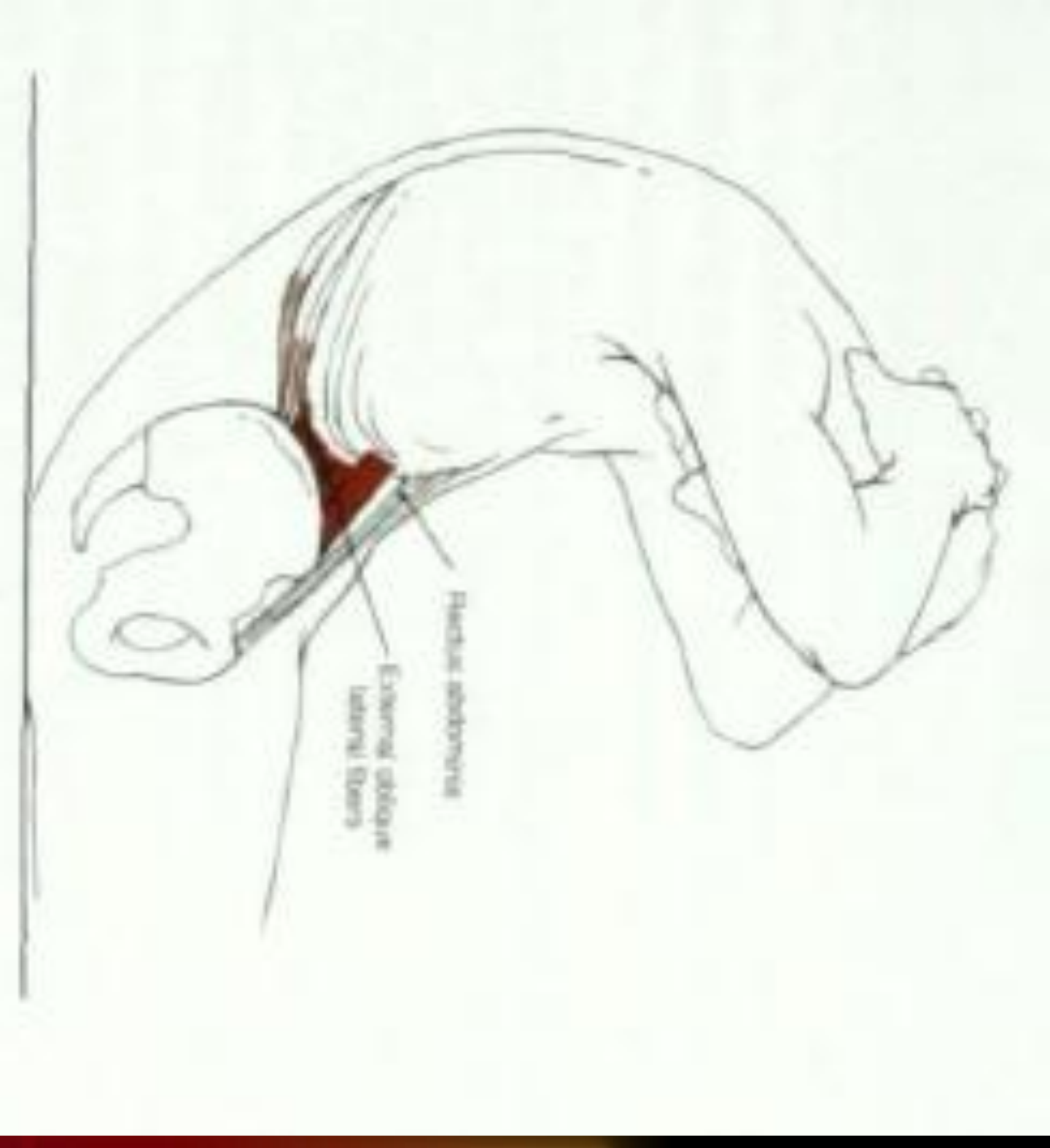


Lateral view of left internal oblique showing a', b', and c' sections.

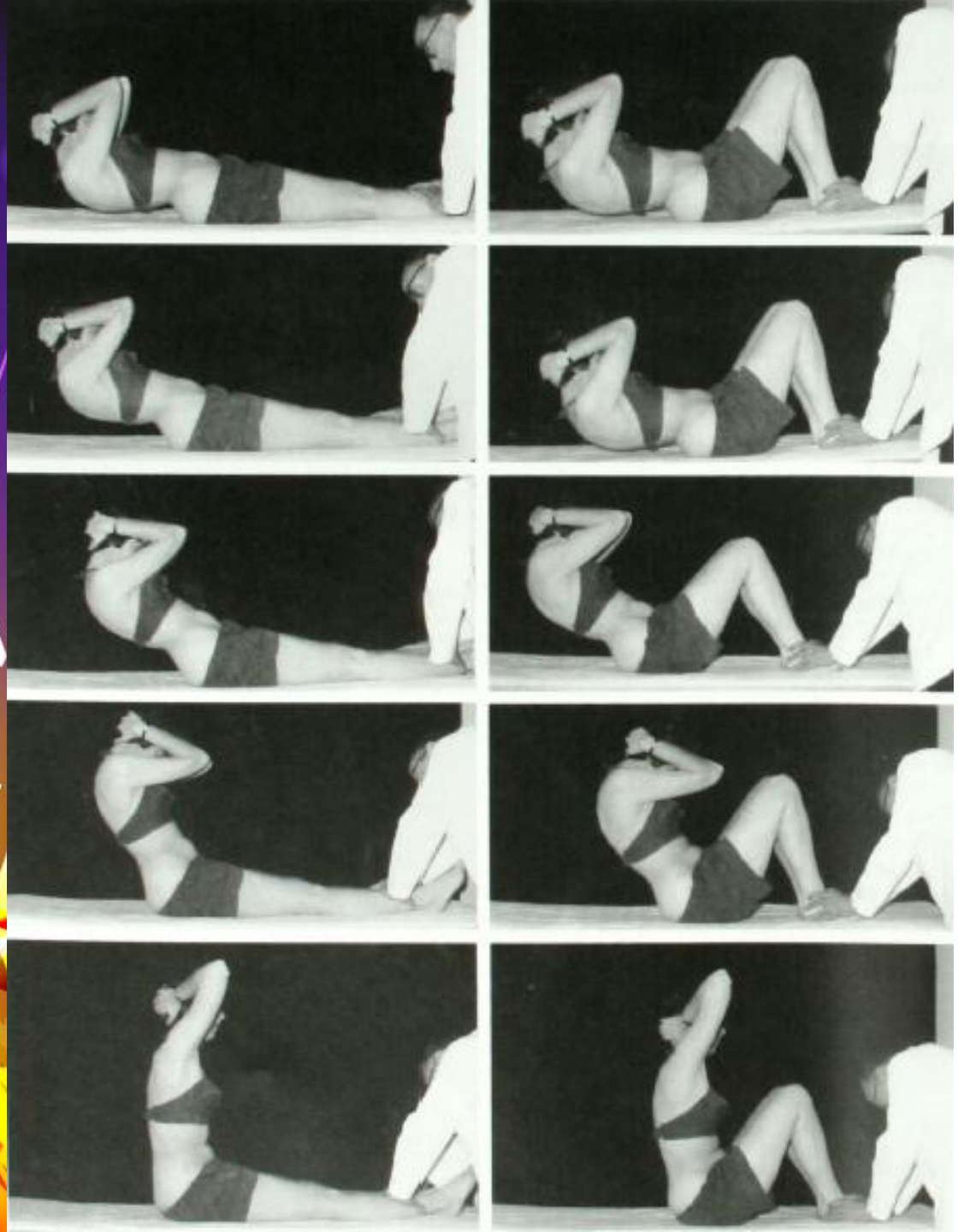
Differentiating Action of The Upper And Lowe Abdominals



Differentiating Action of The Upper and Lower Abdominals

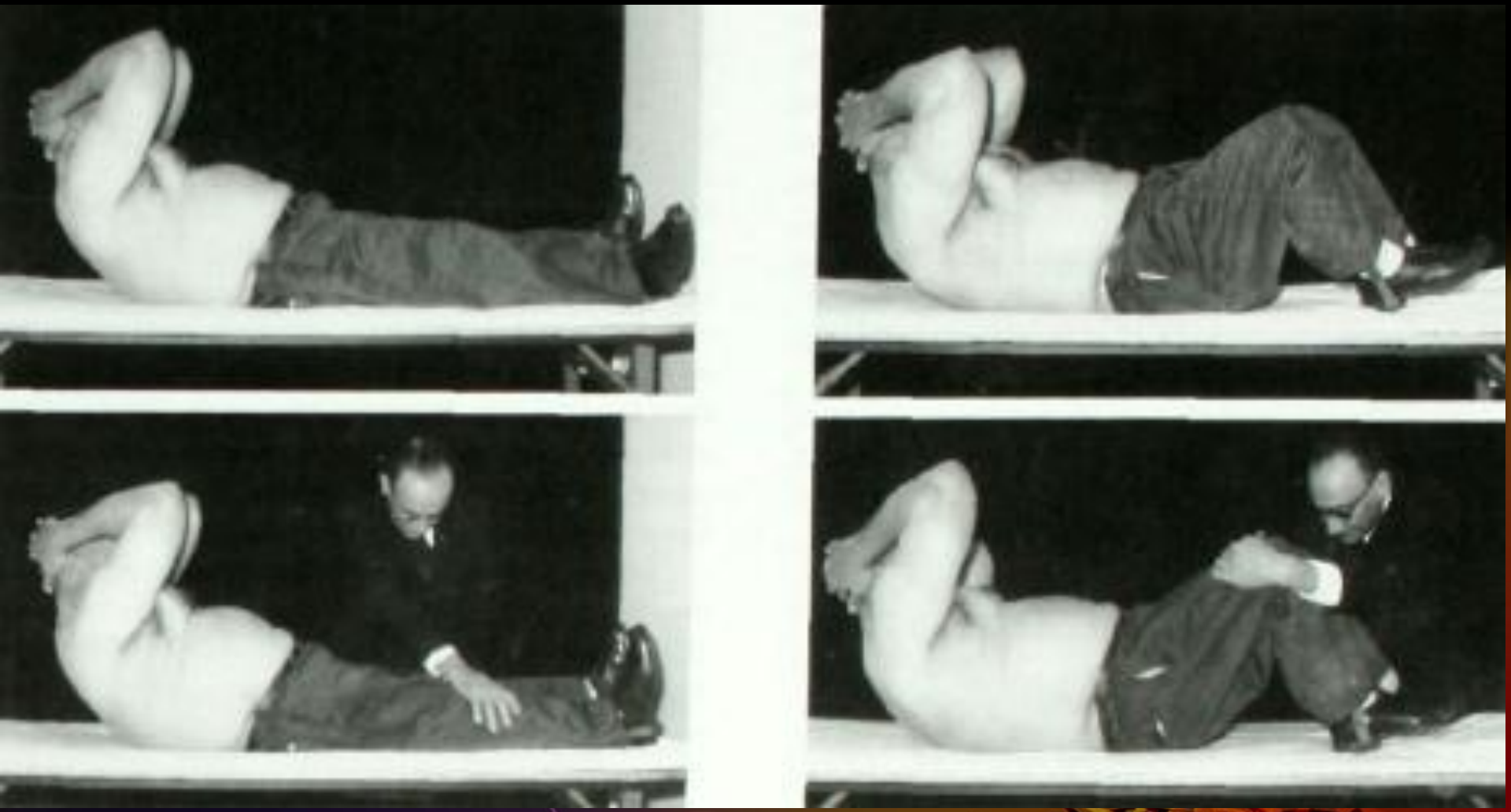


Upper Abdominal Muscles: Testing And Grading

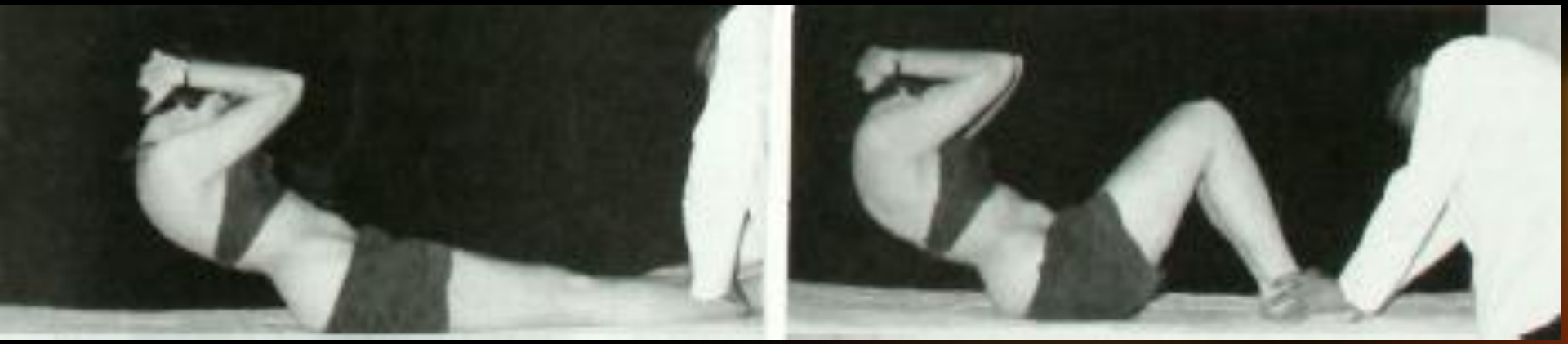


Abdominal Muscle Weakness Trunk Raising

Abdominal And Hip Flexor Imbalance



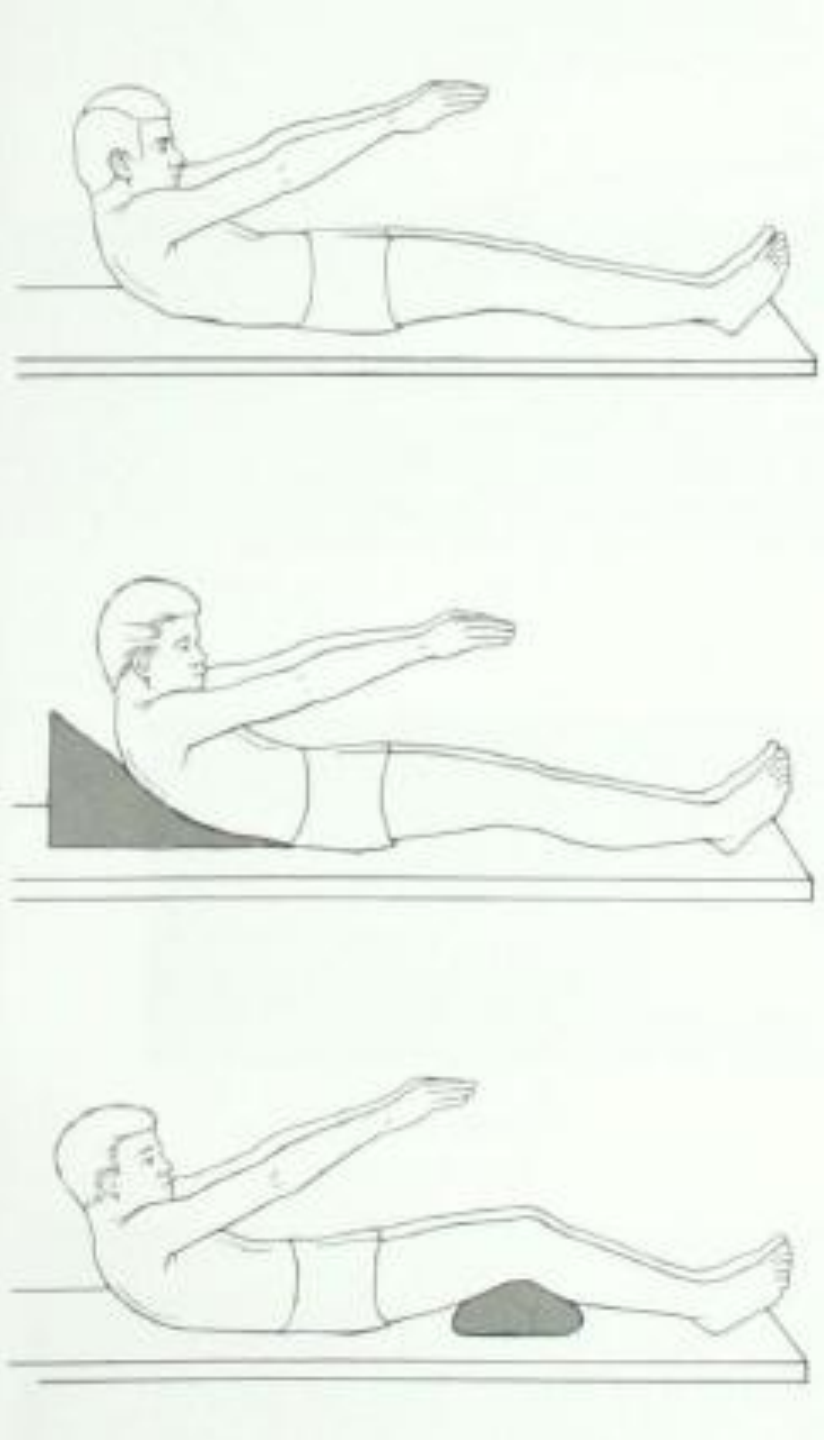
Strong Hip Flexors, Weak Abdominals



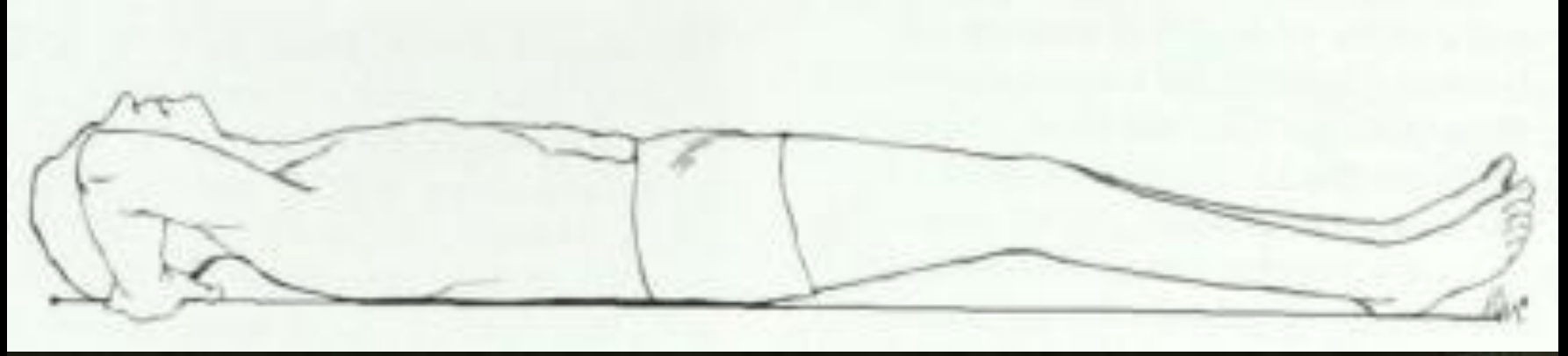
Sit-Up Exercises


A

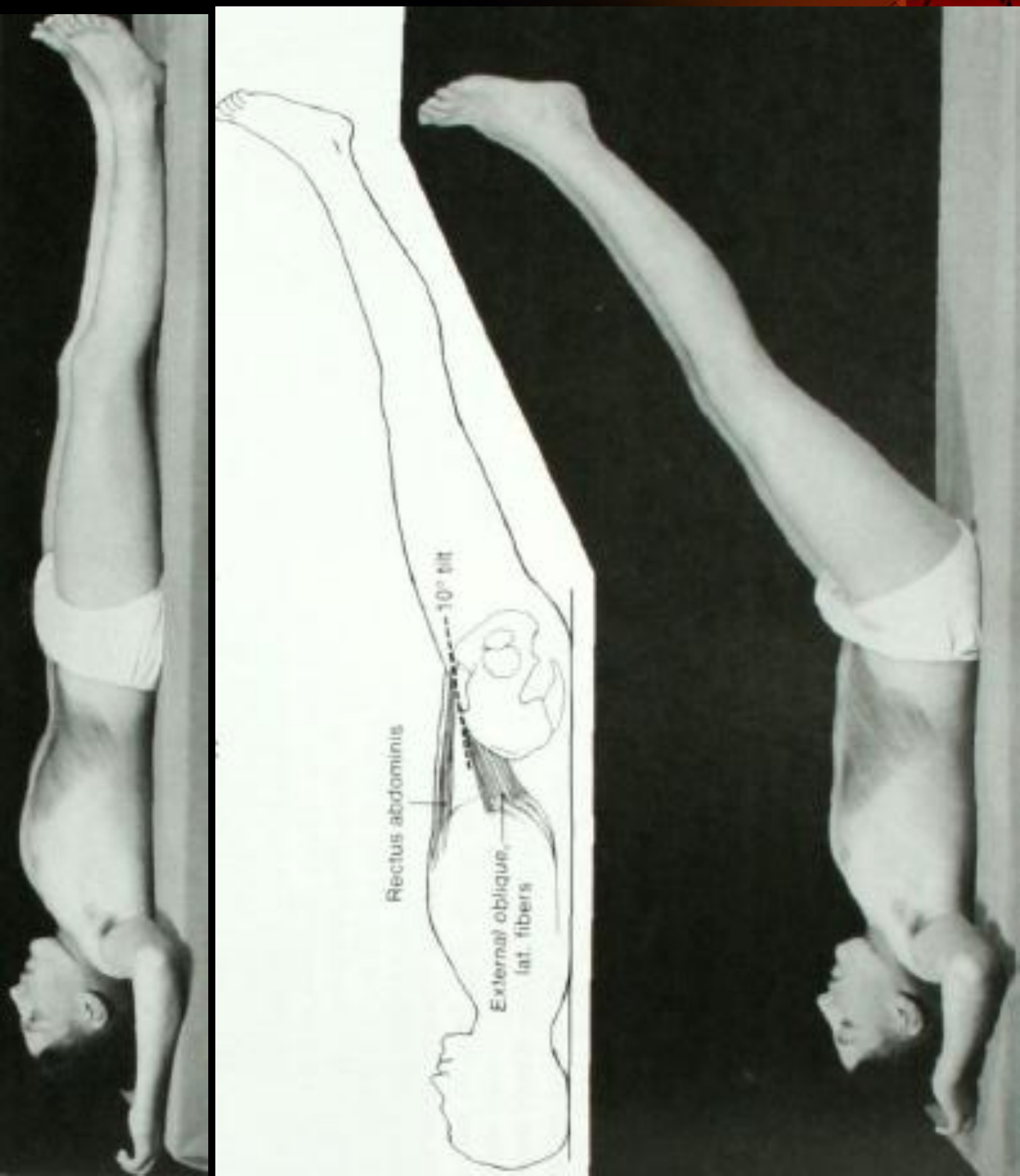

B



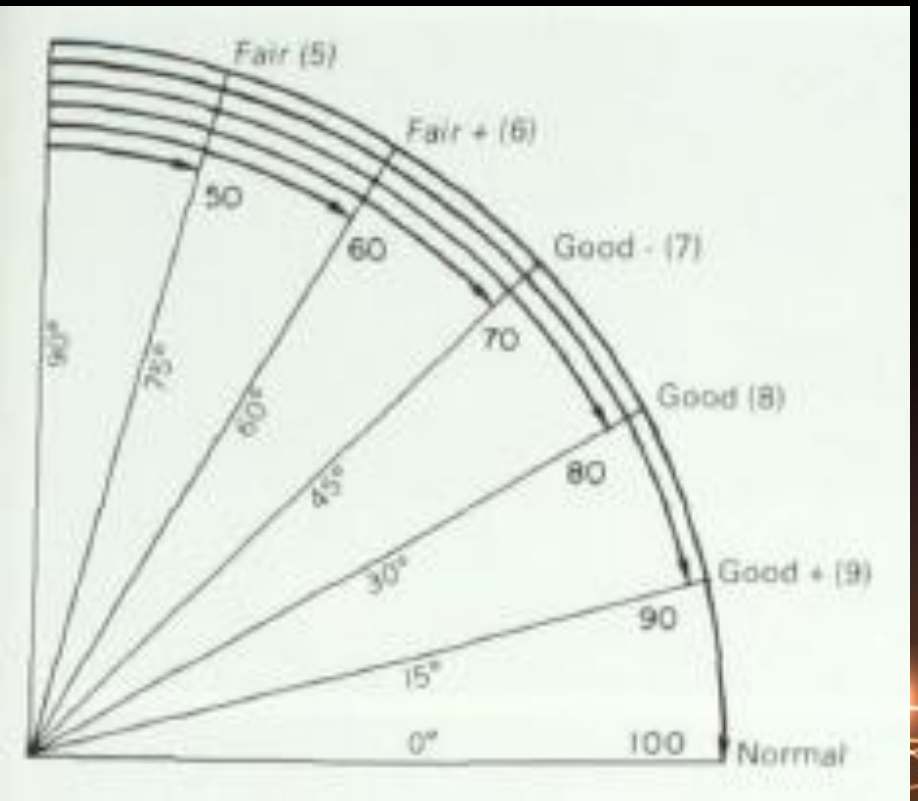
Therapeutic Exercises: Trunk Curl

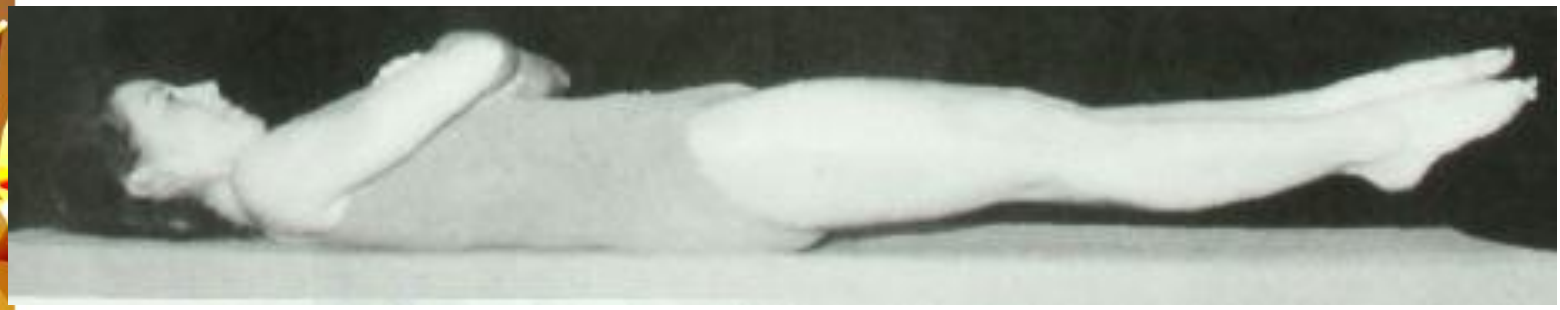


Abdominal Muscle During Leg Lowering

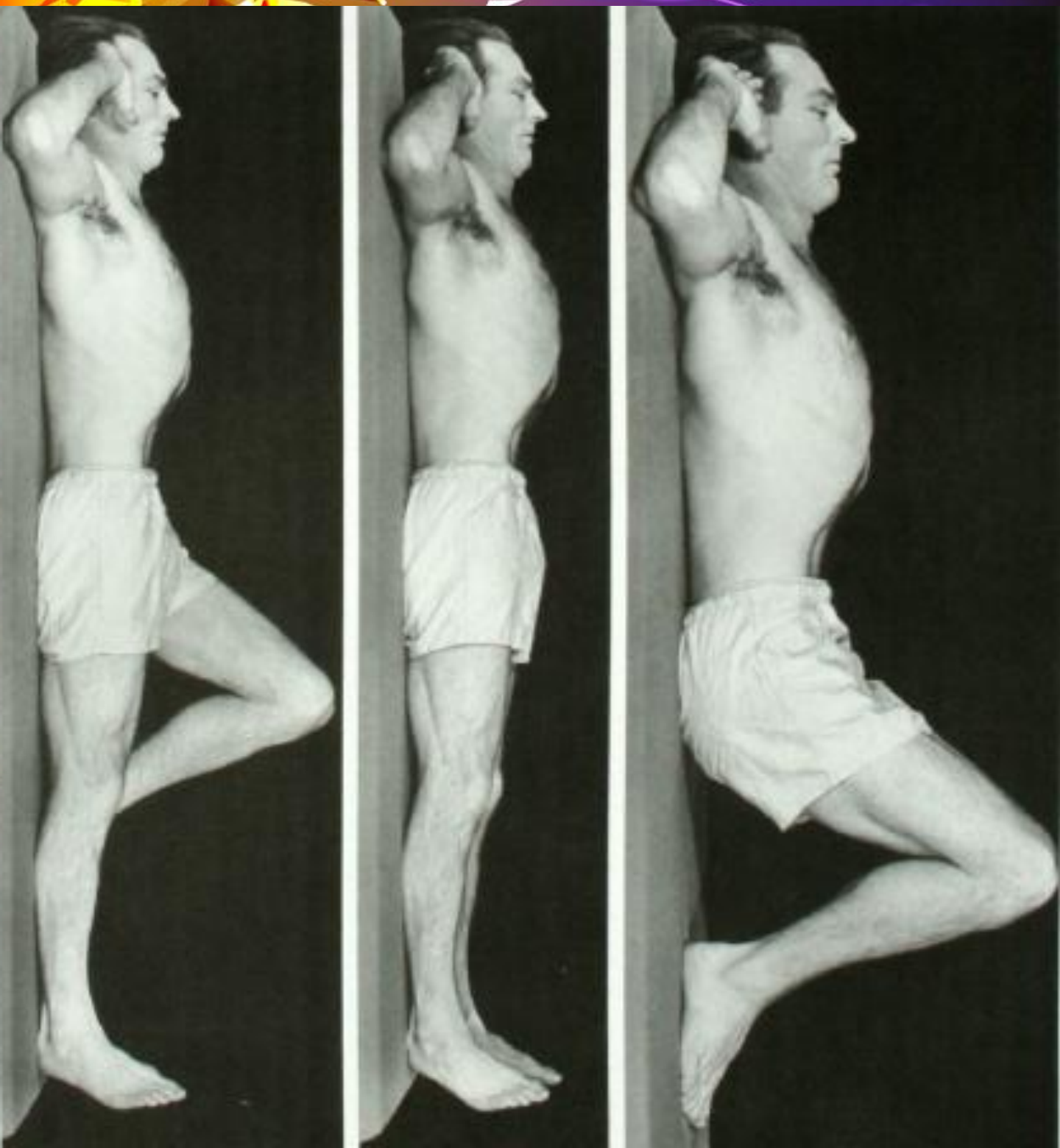


Lower Abdominal Muscles Testing And Grading



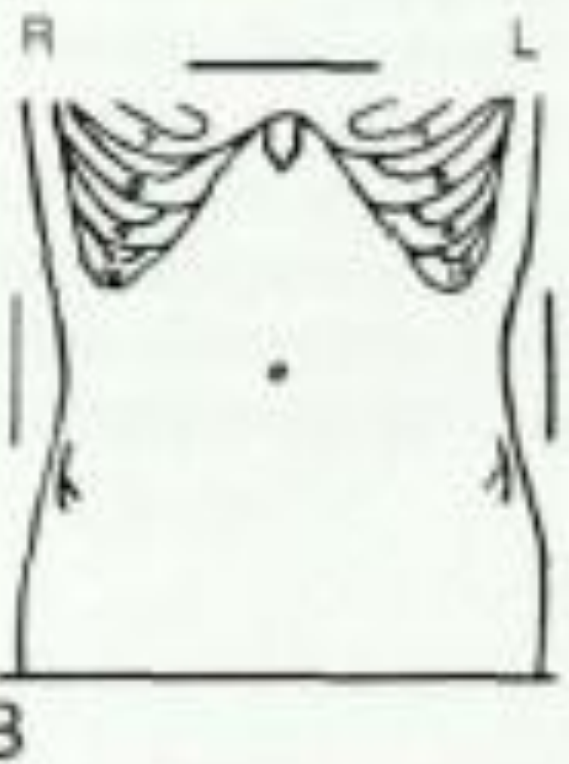


Therapeutic Exercises: Posterior Pelvic Tilt

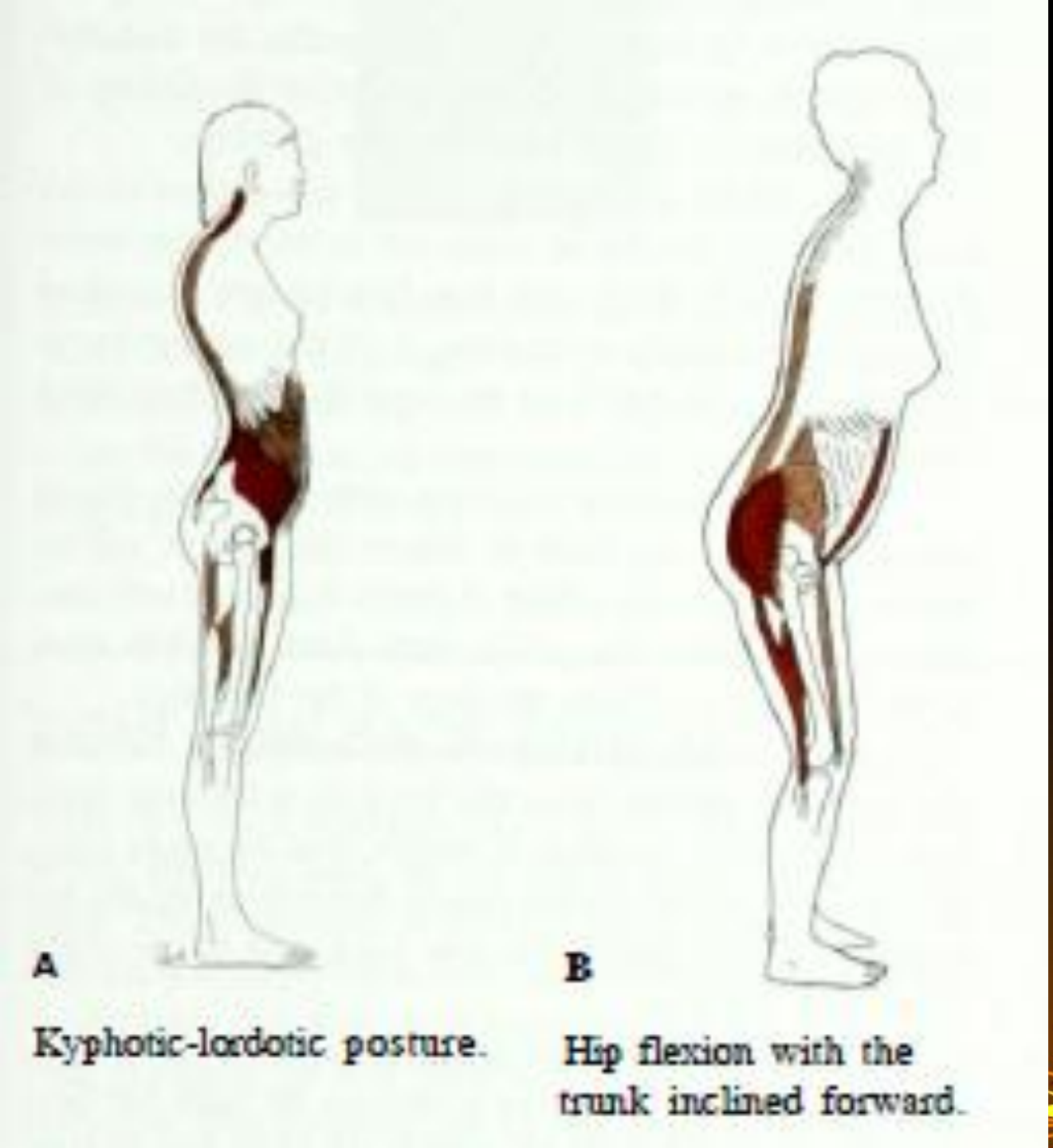


Therapeutic Exercises: Trunk Rotation

Marked Abdominal Muscle Weakness: Testing And Grading



Low Back Pain



A

Kyphotic-lordotic posture.

B

Hip flexion with the trunk inclined forward.

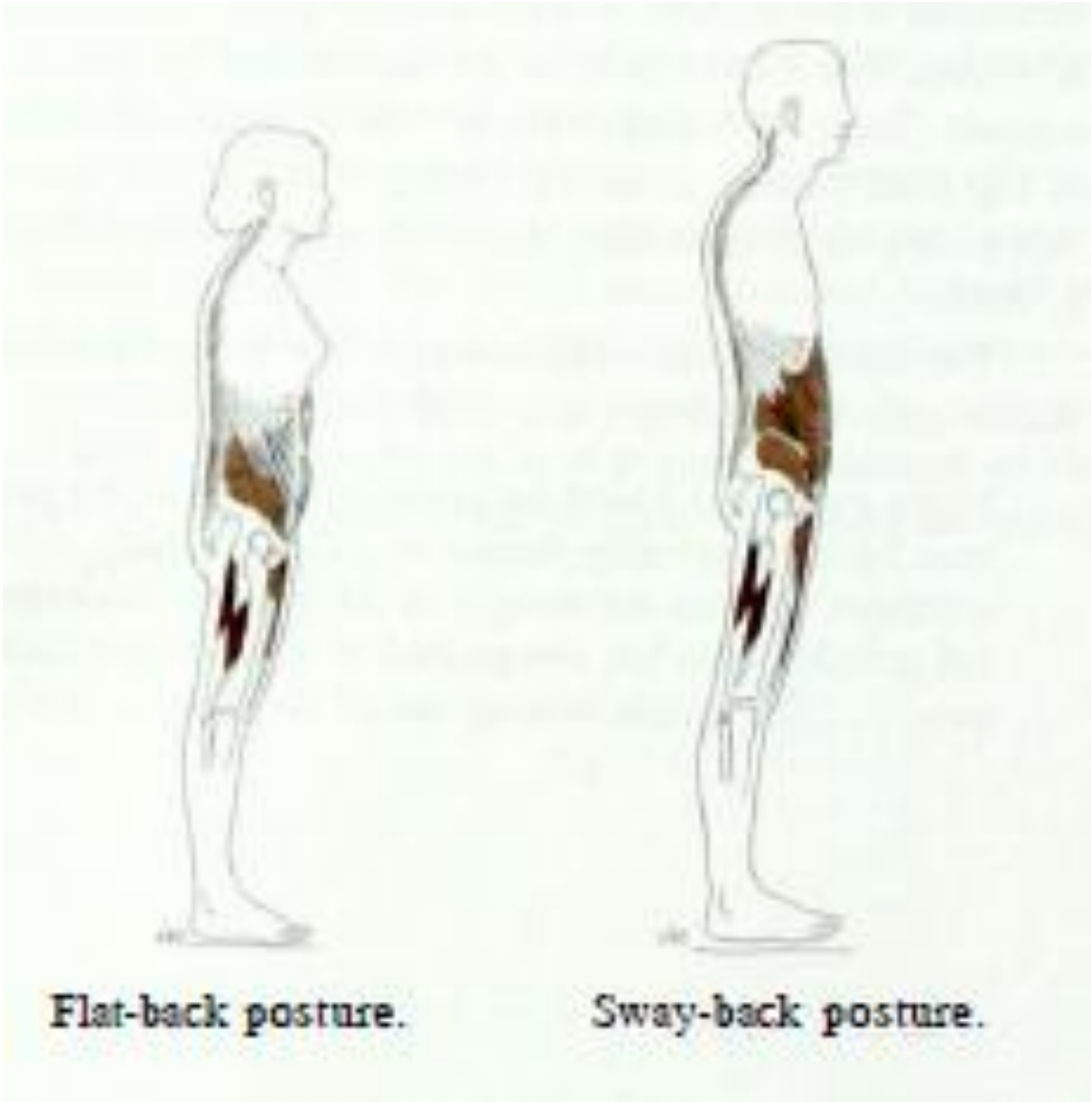
Anterior

Pelvic Tilt


A
B

Back Support

Posterior Pelvic Tilt



Flat-back posture.

Sway-back posture.