

RESEARCH:

J Healthc Eng. 2017;2017:6294503. doi: 10.1155/2017/6294503. Epub 2017 Jun 11.

The Effect of Lumbar Disc Herniation on Spine Loading Characteristics during Trunk Flexion and Two Types of Picking Up Activities.

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Author information

Abstract

The main purpose of this study was to investigate the compensatory response of the muscle activities of seventeen major muscle groups in the spinal region, intradiscal forces of the five lumbar motion segment units (MSUs), and facet forces acting on the ten lumbar facet joints in patients with lumbar disc herniation (LDH). Twenty-six healthy adults and seven LDH patients performed trunk flexion, ipsilateral picking up, and contralateral picking up in sequence. Eight optical markers were placed on the landmarks of the pelvis and spinal process. The coordinates of these markers were captured to drive a musculoskeletal model to calculate the muscle activities, intradiscal forces, and facet forces. The muscle activities of the majority of the seventeen major muscle groups were found increases in LDH patients. In addition, the LDH patients displayed larger compressive forces and anteroposterior forces on all the five lumbar MSUs and more lumbar facet inventions on most facet joints. These findings suggest that the LDH patients demonstrate compensatory increases in the most trunk muscle activities and all spinal loads. These negative compensatory responses increase the risk of the aggravation of disc herniation. Therefore, treatment should intervene as earlier as possible for the severe LDH patients.

MECHANISM OF LBP IN WEIGHT TRAINING POPULATION



OVER-EMPHASIS
ON THE
POSTERIOR CHAIN

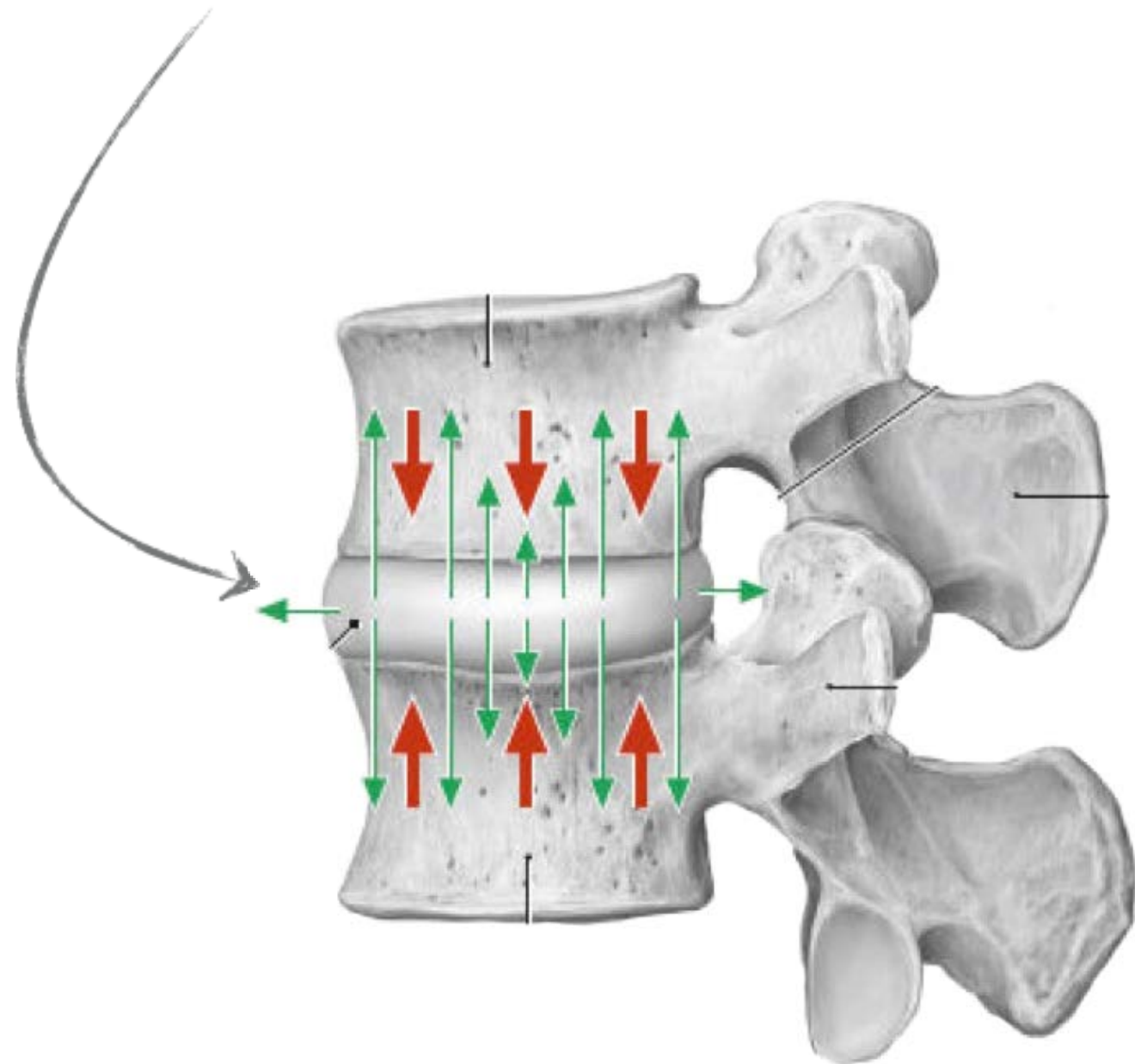


INCREASED
SPINAL
COMPRESSION



INCREASED
INTRADISCAL
PRESSURE

Increased compression = increased intradiscal pressure



LOAD IS NOT THE
ONLY WAY TO
INCREASE THE
TENSION IN
ANNULAR FIBERS
OF A VERTEBRAL
DISC.

MECHANISM OF LBP
IN WEIGHT TRAINING
POPULATION



OVER-EMPHASIS
ON THE
POSTERIOR CHAIN



INCREASED
SPINAL
COMPRESSION



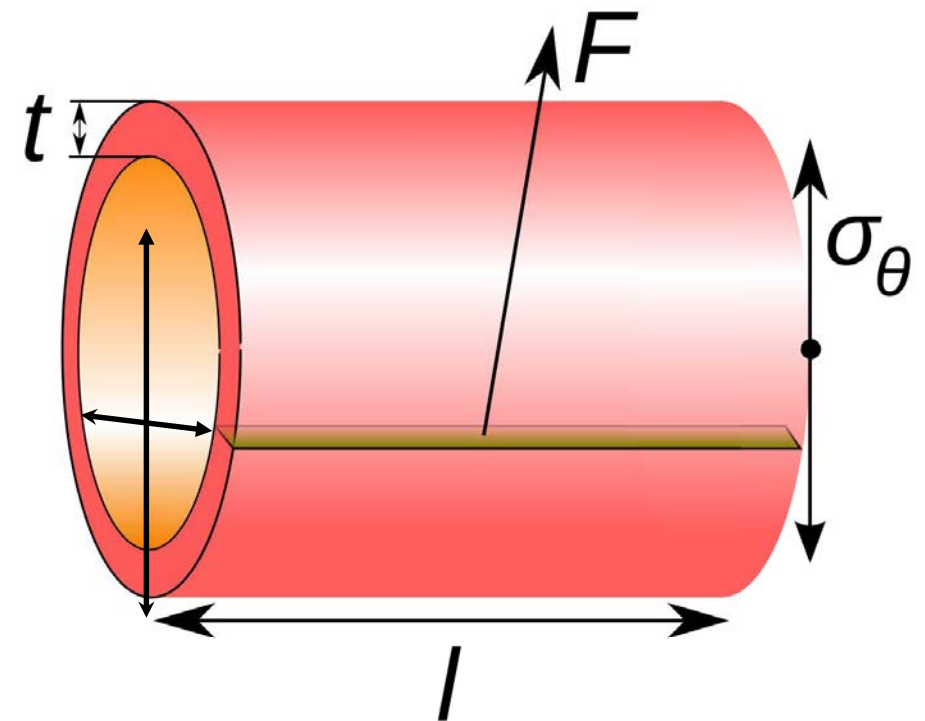
INCREASED
INTRADISCAL
PRESSURE



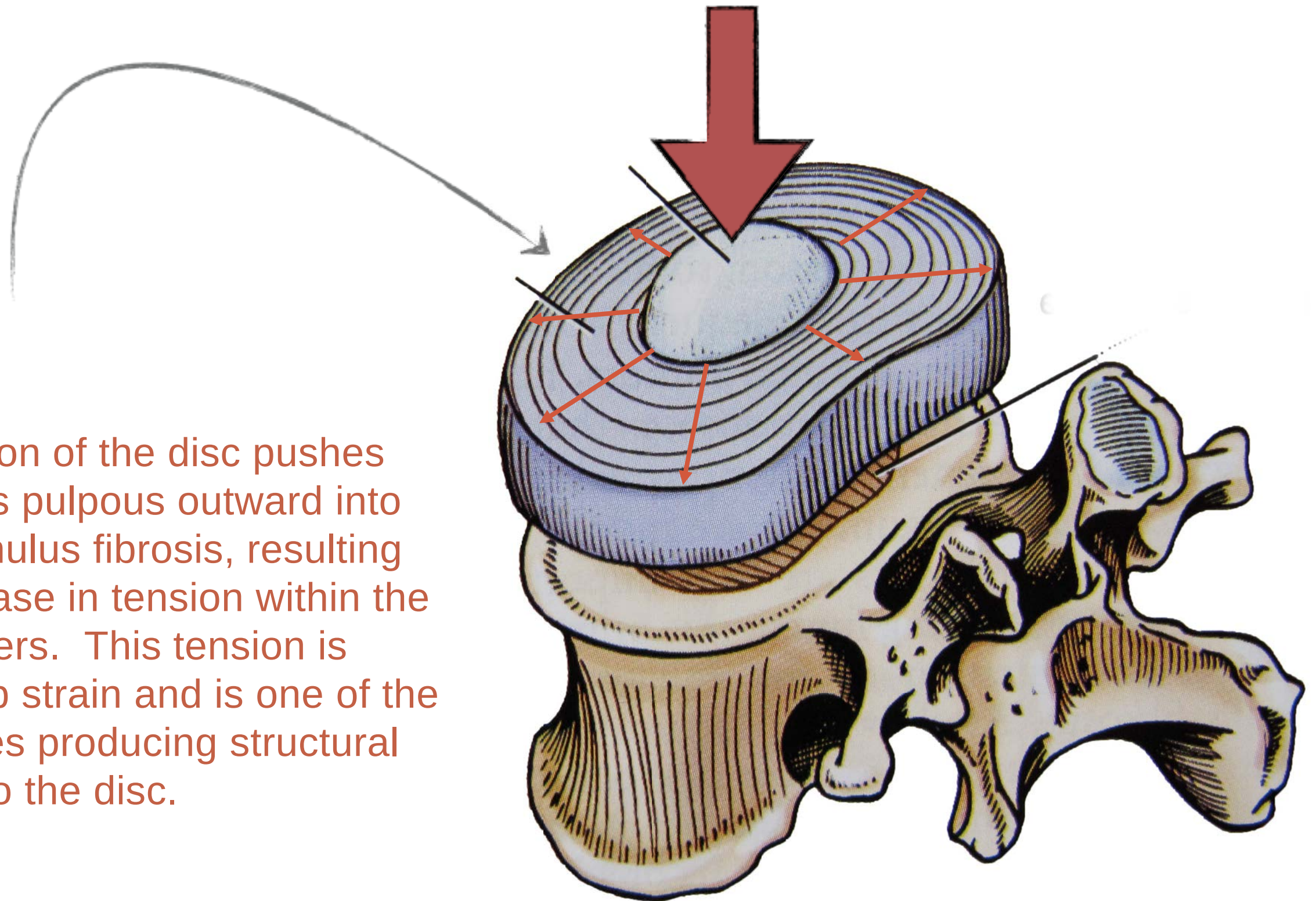
INCREASED
HOOP STRAIN

Hoop Strain | N. |

*A force applied circumferentially to
the walls of a cylinder.*



BIOMECHANICS OF THE DISC

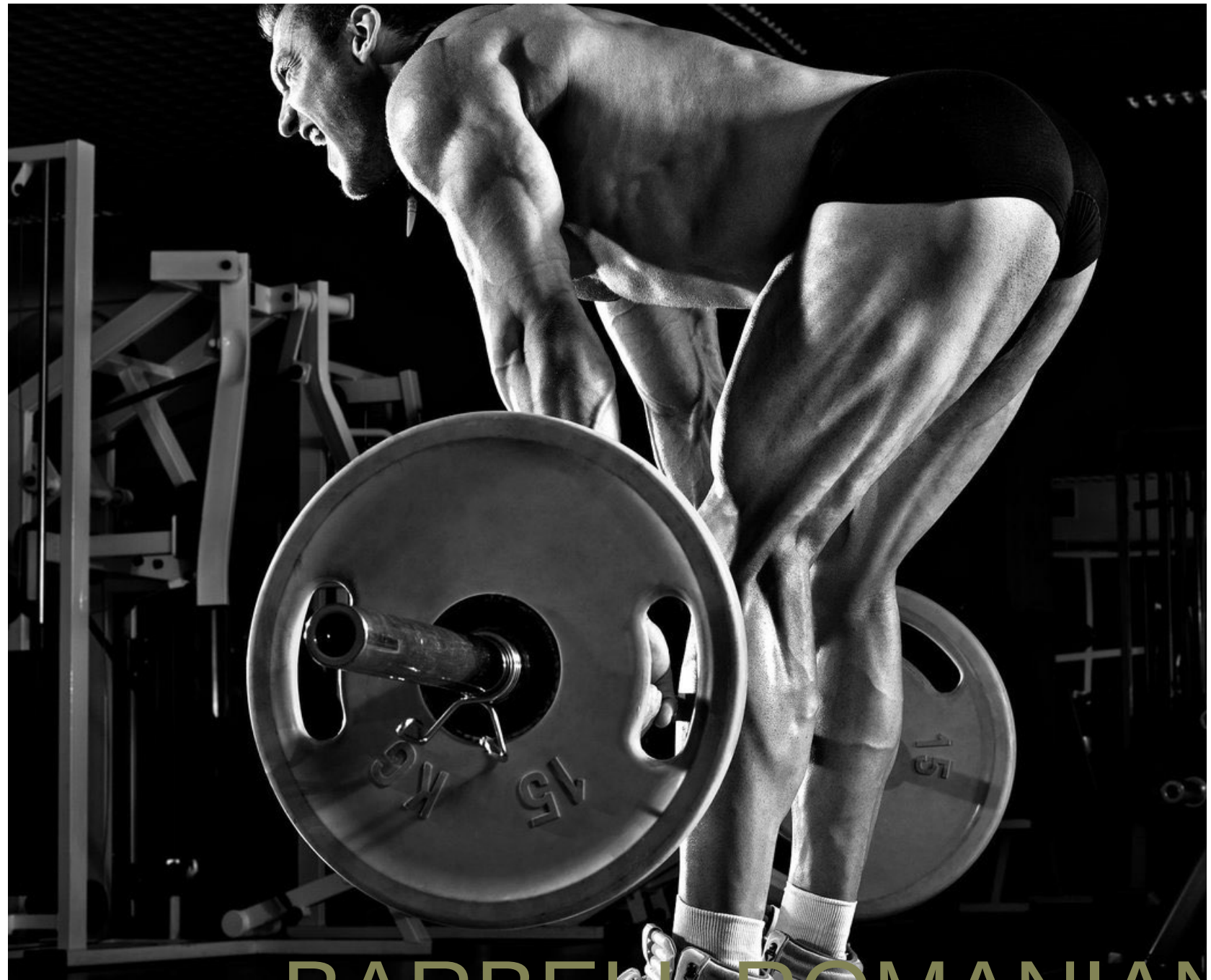


Compression of the disc pushes the nucleus pulposus outward into the the annulus fibrosis, resulting in an increase in tension within the annular fibers. This tension is called hoop strain and is one of the major forces producing structural distortion to the disc.

MECHANISM OF LBP
IN WEIGHT TRAINING
POPULATION



OVER-EMPHASIS
ON THE
POSTERIOR CHAIN



BARBELL ROMANIAN
DEADLIFT

MECHANISM OF LBP
IN WEIGHT TRAINING
POPULATION



OVER-EMPHASIS
ON THE
POSTERIOR CHAIN



HYPERACTIVITY
OF THE SPINAL
EXTENSORS



30 YO MALE WEIGHT
LIFTER
DISC HERNIATION AT
L3/4 & L4/5
2 LEVELS OF SPONDY

MECHANISM OF LBP
IN WEIGHT TRAINING
POPULATION



OVER-EMPHASIS
ON THE
POSTERIOR CHAIN



HYPERACTIVITY
OF THE SPINAL
EXTENSORS



LOSS OF
ECCENTRIC
FUNCTION OF THE
SPINAL EXTENSORS



JENNY
BORDA, DPT

GYMNASTICS
HOLLOW POSITION

MECHANISM OF LBP
IN WEIGHT TRAINING
POPULATION



OVER-EMPHASIS
ON THE
POSTERIOR CHAIN



HYPERACTIVITY
OF THE SPINAL
EXTENSORS



LOSS OF
ECCENTRIC
FUNCTION OF THE
SPINAL EXTENSORS



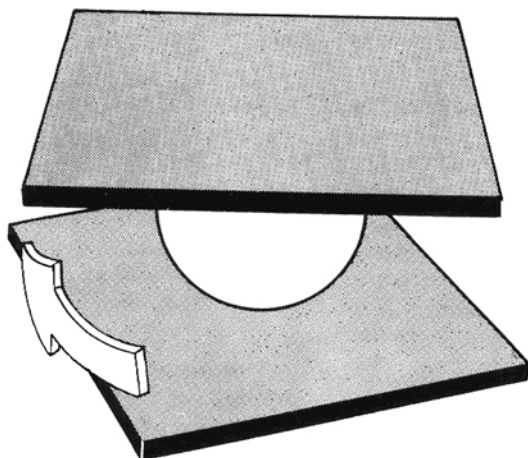
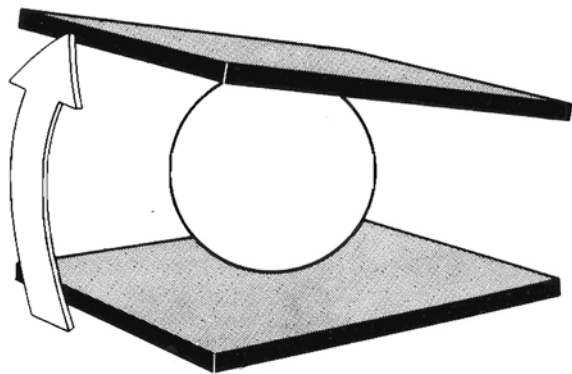
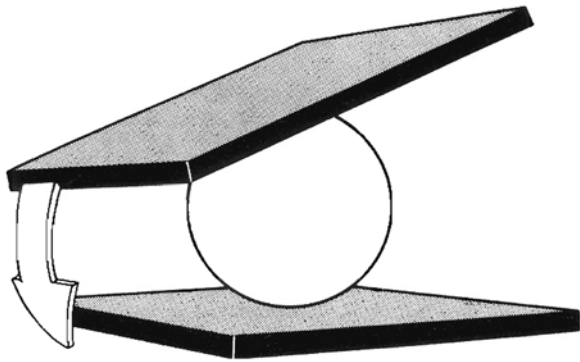
INCREASED INTRADISCAL
PRESSURE WITH FLEXION



Intervetebral discs have many similarities to a jelly-filled doughnut.

HYDRODYNAMICS OF THE DISC

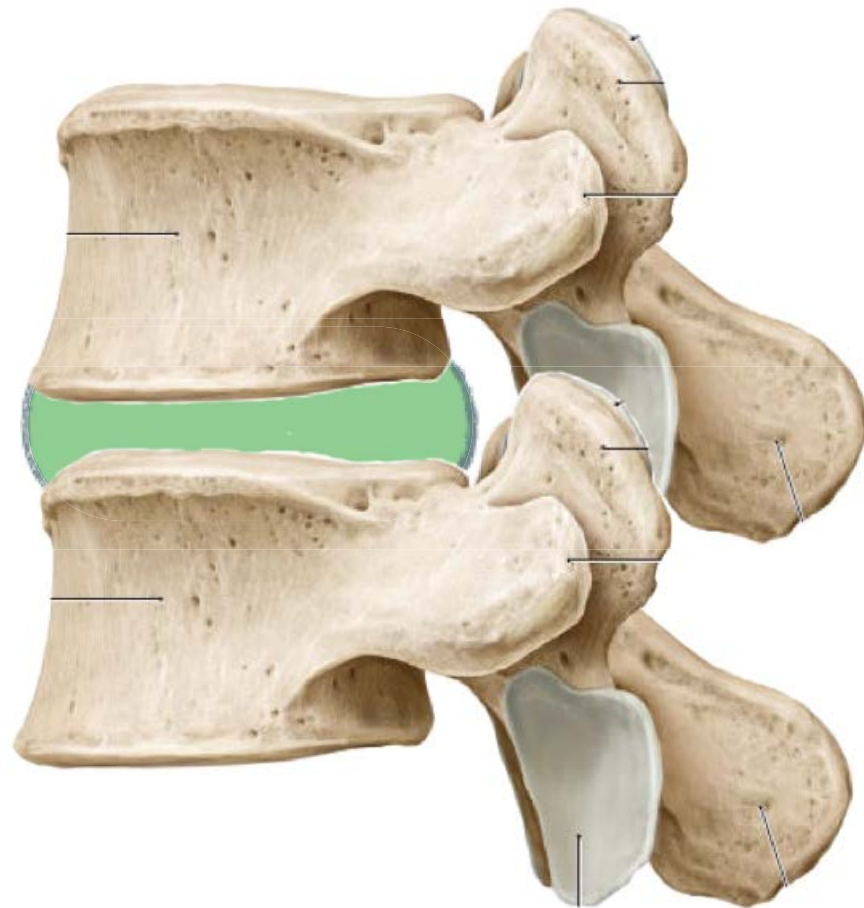
ROTATION
EXTENSION
FLEXION



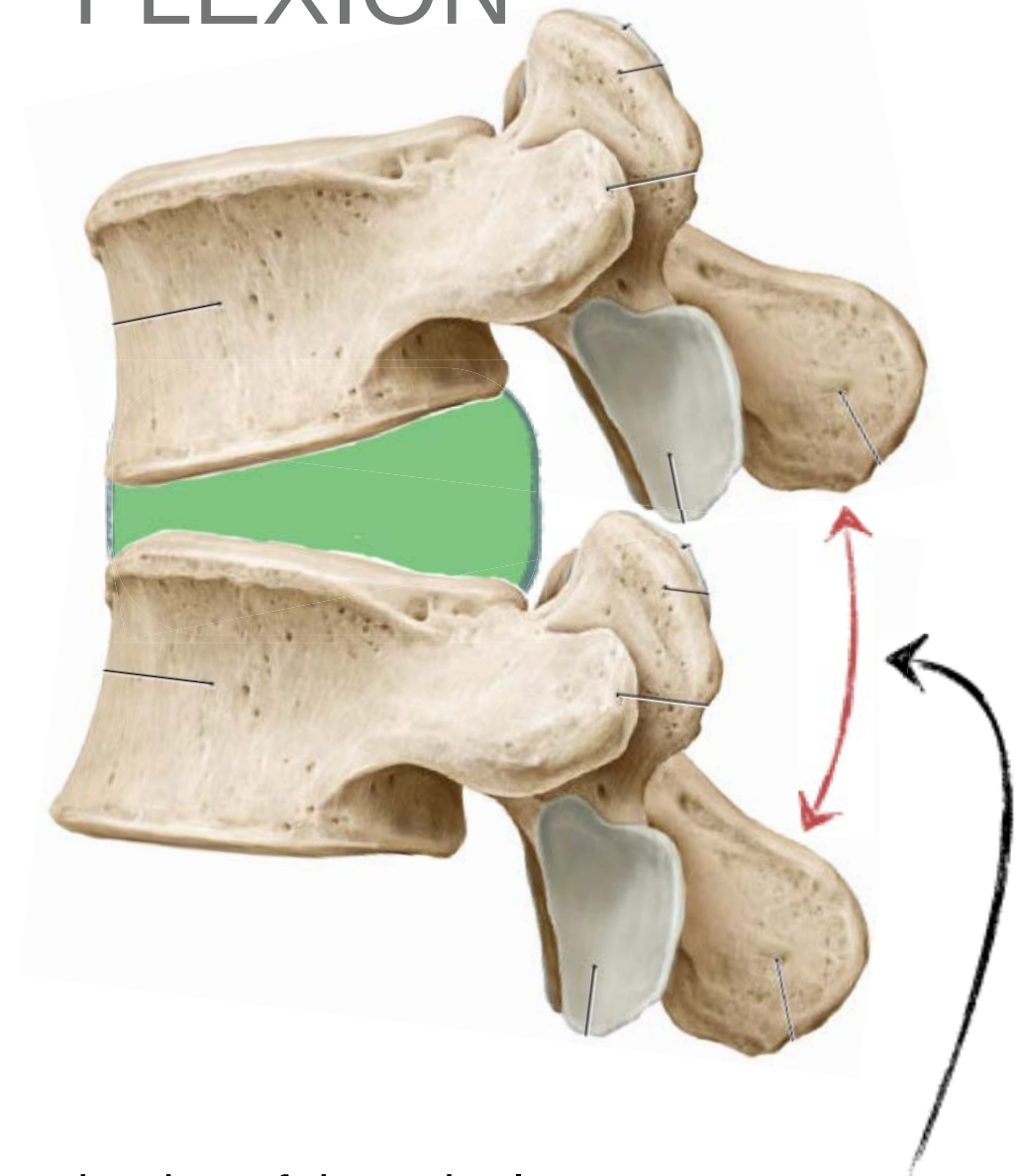
BIOMECHANICS OF THE DISC

HEALTHY SPINE

NEUTRAL



FLEXION



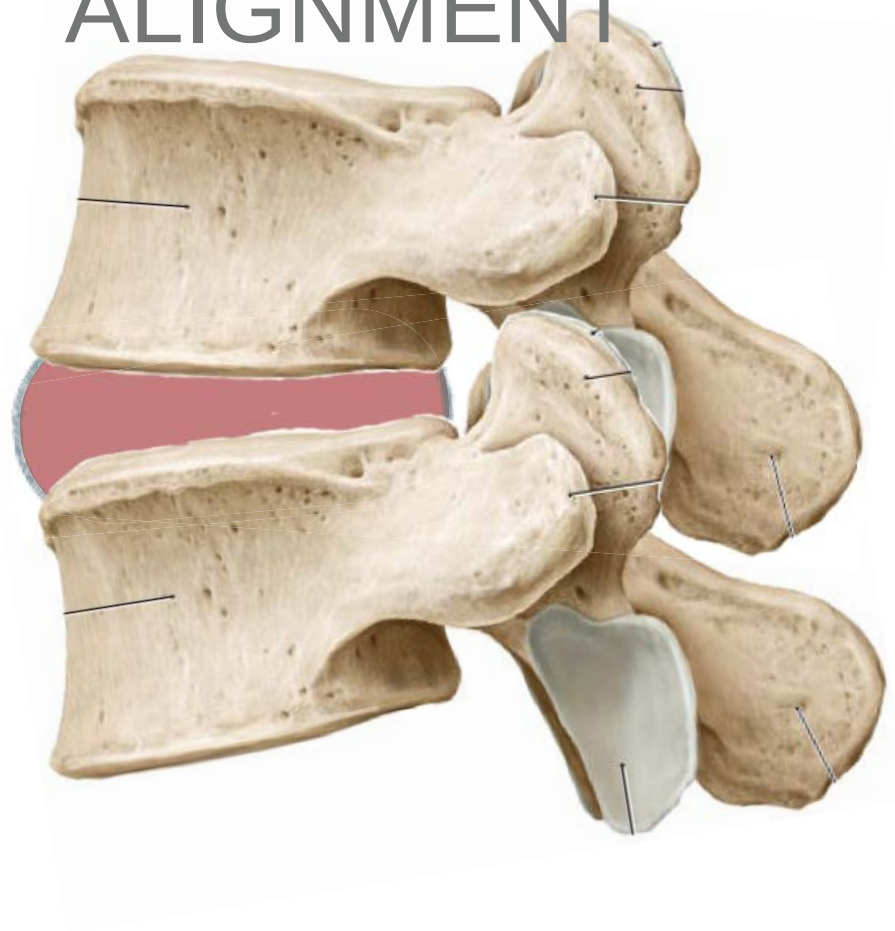
Eccentric lengthening of the spinal extensors.

BIOMECHANICS OF THE DISC

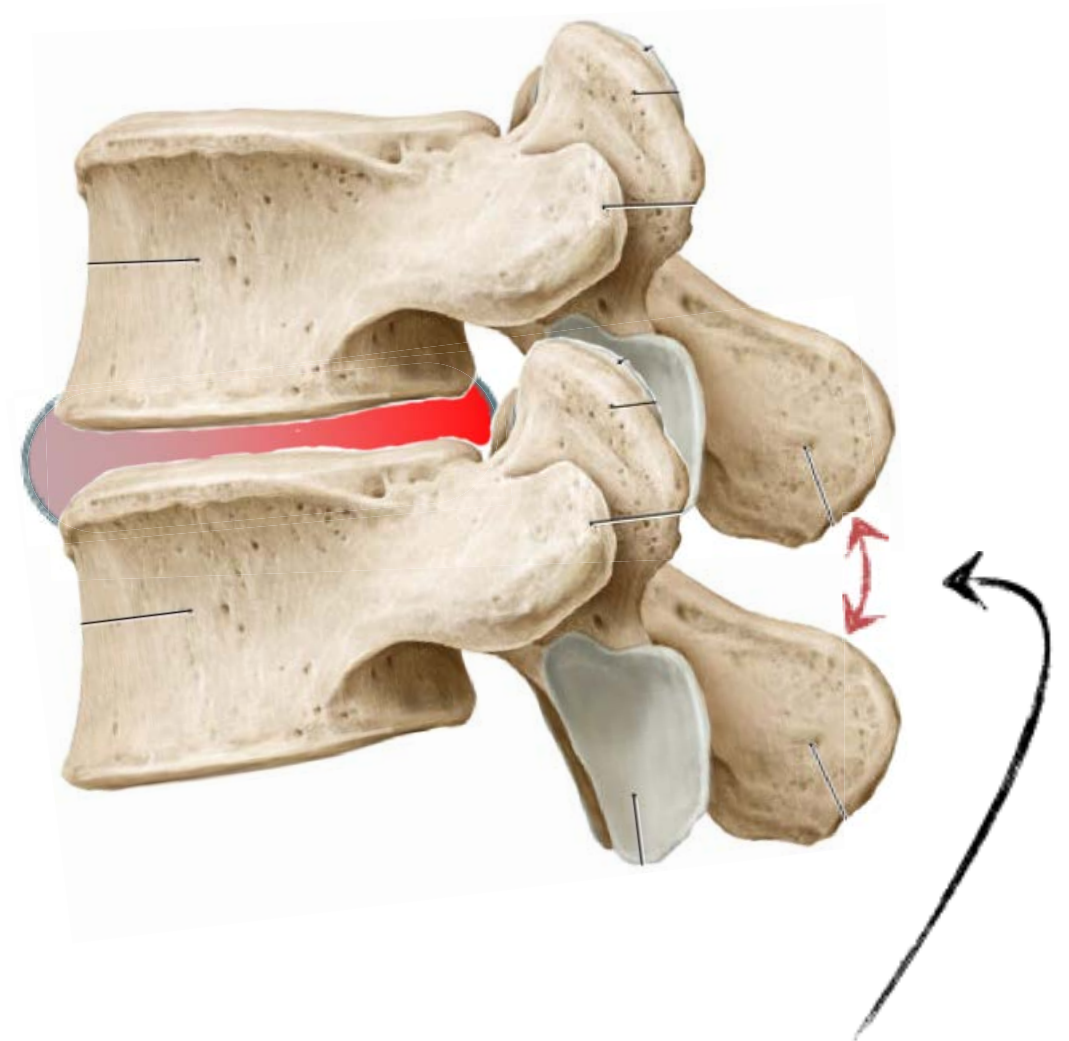
UNHEALTHY SPINE

Hyperactive posterior chain

STANDING
ALIGNMENT



FLEXION

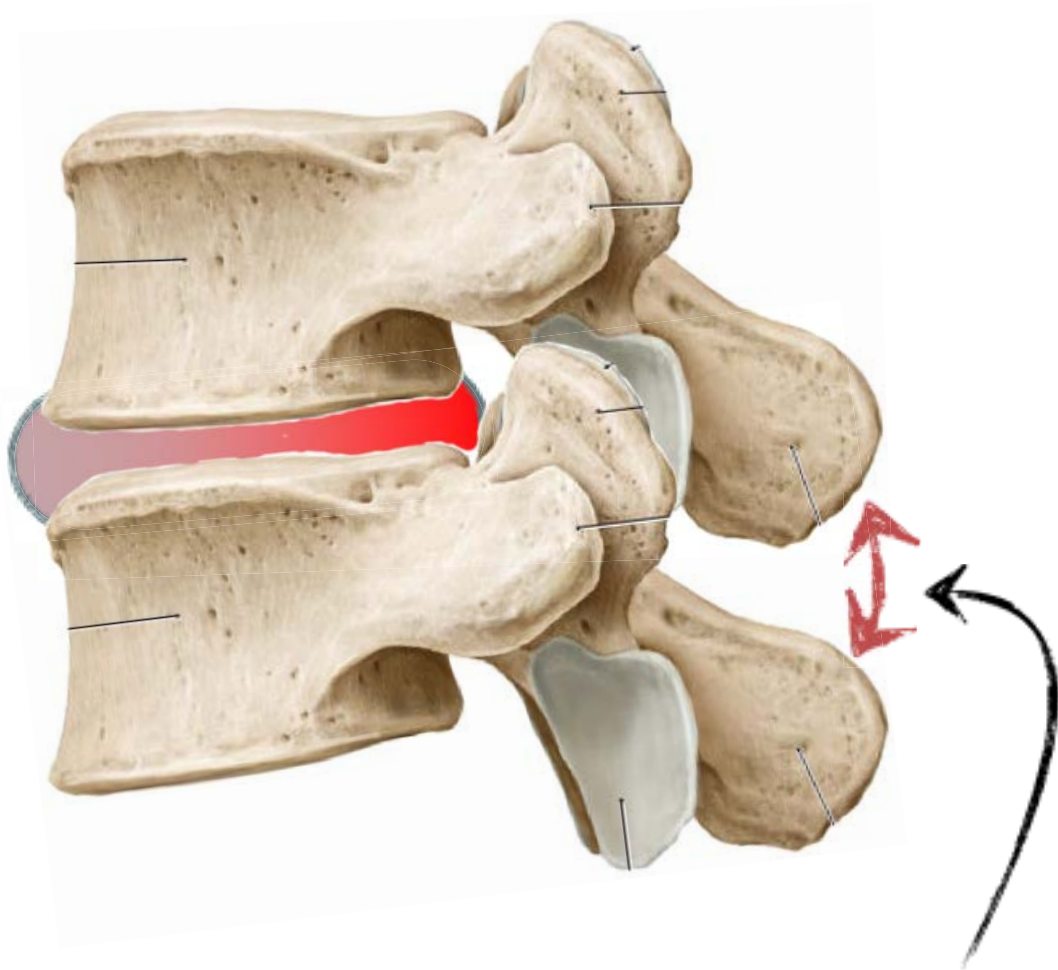


Insufficient eccentric lengthening of the spinal extensors.

DRODYNAMICS OF THE DISC

UNHEALTHY SPINE

Hyperactive posterior chain



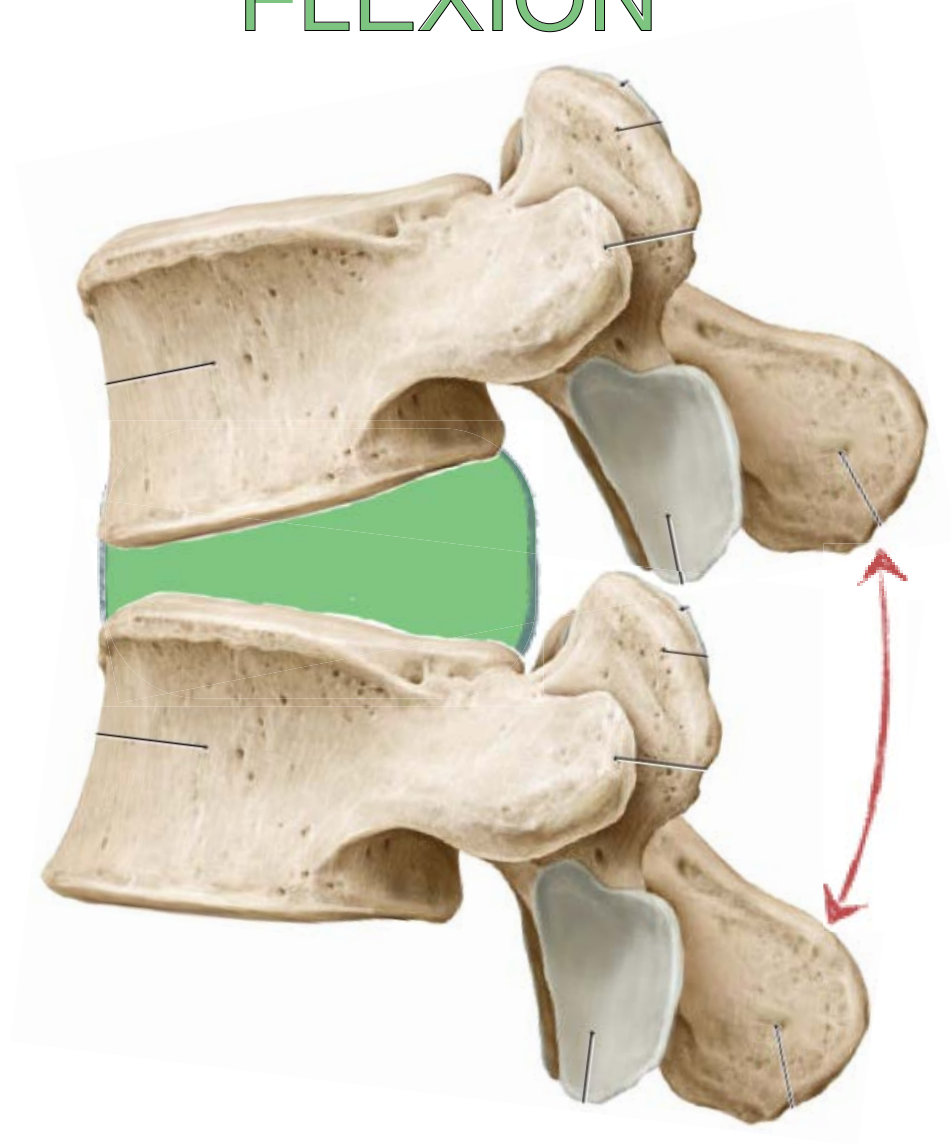
Lack of eccentric function creates a fulcrum from which the disc is crushed during flexion movements.

2nd class lever

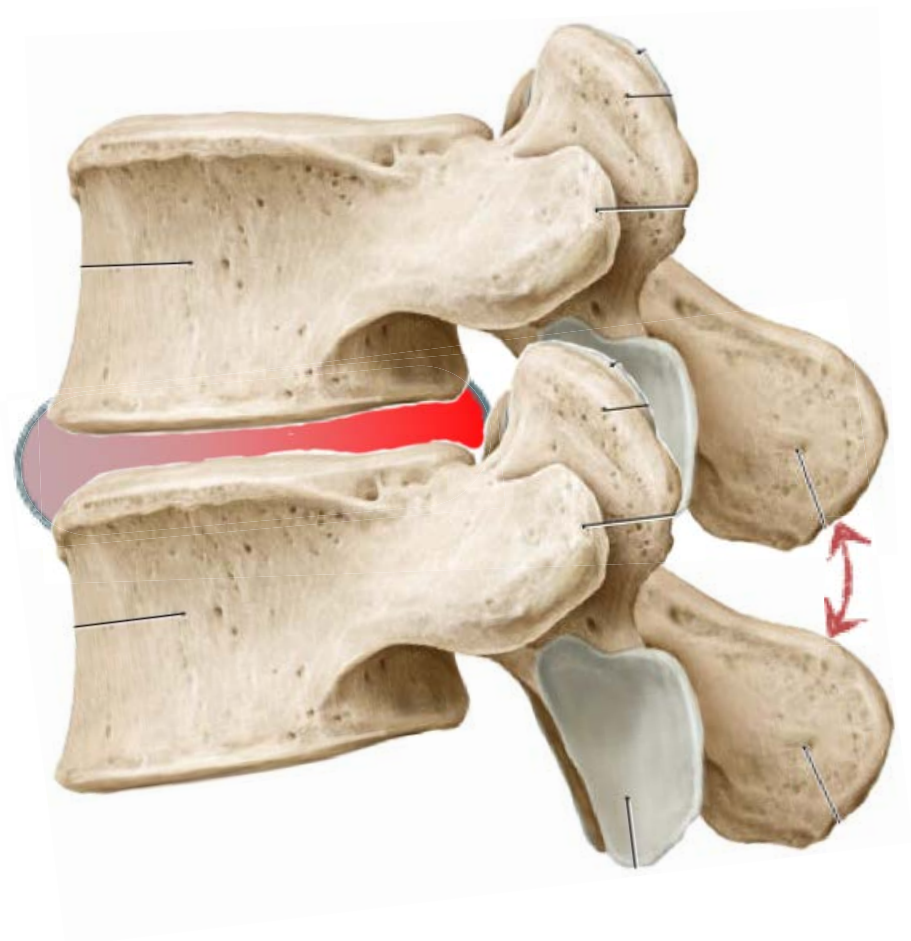


BIOMECHANICS OF THE DISC

HEALTHY SPINE IN
FLEXION



UNHEALTHY SPINE IN
FLEXION



WHAT I'M NOT SAYING:

*“Training the posterior chain is
unimportant in strength and performance
development.”*

-NOT Richard Ulm, DC

WHAT I'M AM SAYING:

“Because of the short-term benefits in performance and the obvious need to avoid loading the spine in flexion, the strength & conditioning profession tends to hyper-emphasize training the posterior chain; over-development of which often produces movement dysfunction, reduced long-term performance and may increase the likelihood of injury.”

- Richard Ulm, DC