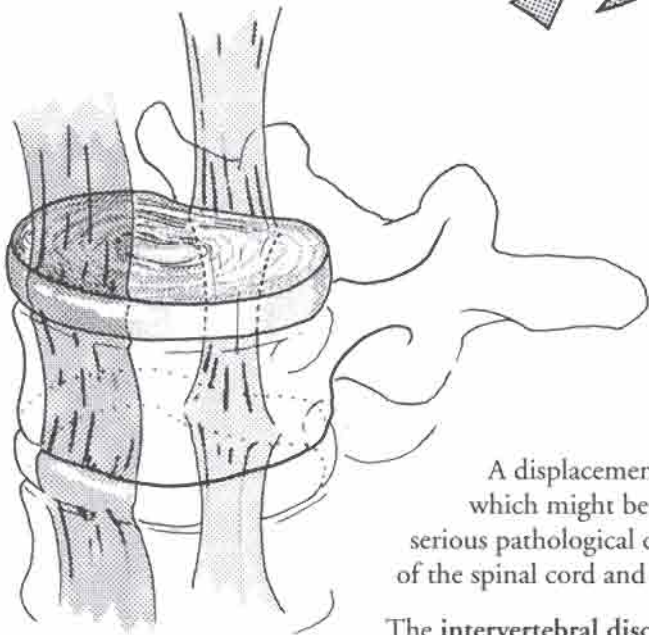
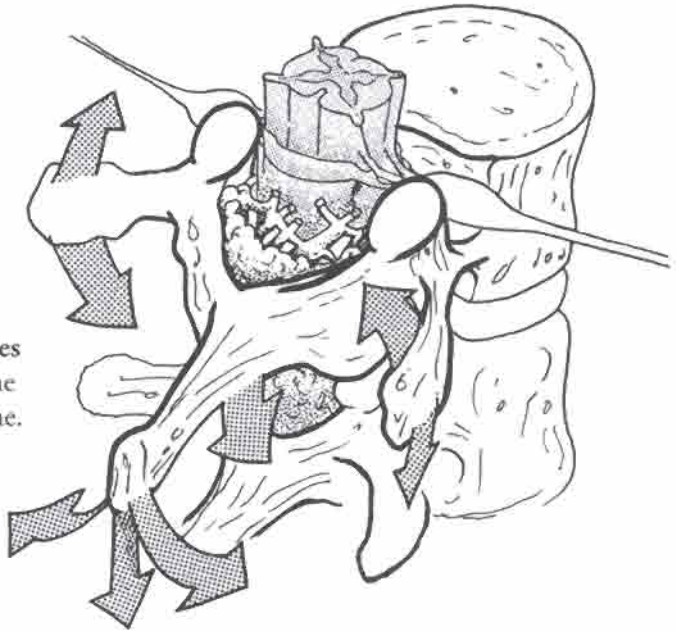


Vertebral structure

A brief review of anatomy (see *AOM*, pp. 32–3).

The anterior part of the vertebra is the massive **body**, designed to bear weight. The **posterior arch** and its foramen enclose the nerve structures: the spinal cord (with its meninges), and the spinal nerves that exit at each level.

The **transverse and spinous processes** are attachment points for the muscles that move the spine.



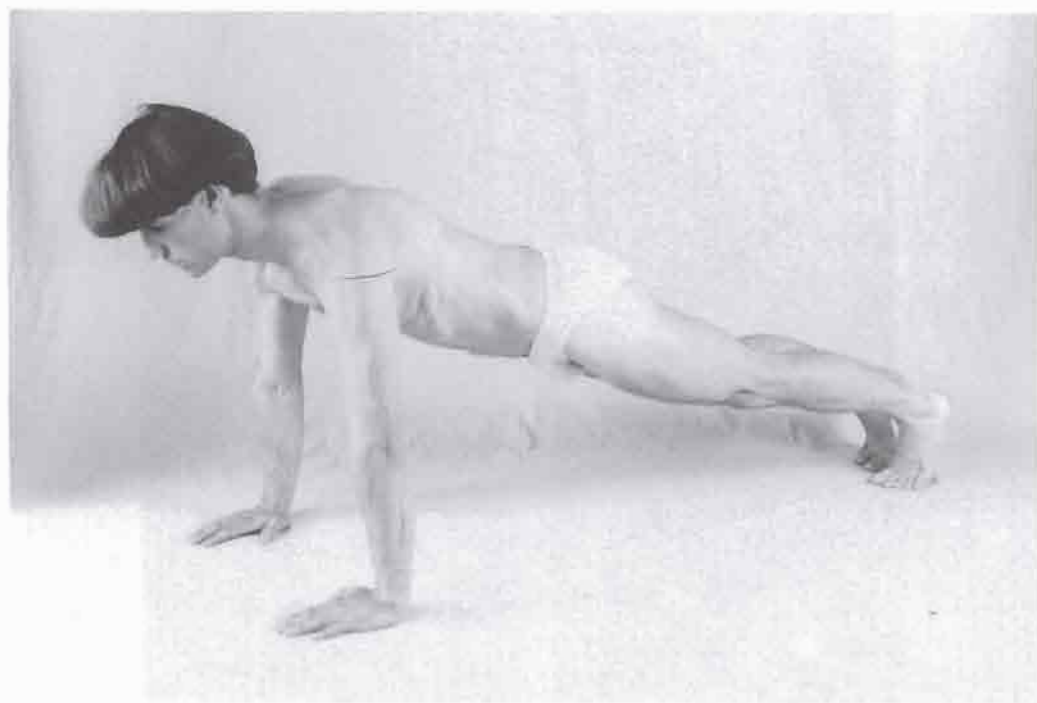
A displacement or a sprain in the posterior spine, which might be trivial at some other joint, can have serious pathological consequences because of the proximity of the spinal cord and nerves.

The **intervertebral disc** consists of a central gelatinous **nucleus pulposus** and a peripheral fibrocartilage **annulus fibrosus**, concentrically layered around the nucleus. The disc acts as a shock absorber, and can alter its shape. The discs are attached to the vertebral bodies by thin layers of cartilage, and are collectively held in place by the **posterior and anterior longitudinal ligaments**, which adhere to the discs and vertebral bodies respectively (see *AOM*, pp. 33–4).

Strengthening of shoulder muscles

In daily life, demands for muscular strength of the shoulder are relatively low. In contrast to the legs, the arms are not routinely required to bear heavy loads. However, two points should be kept in mind:

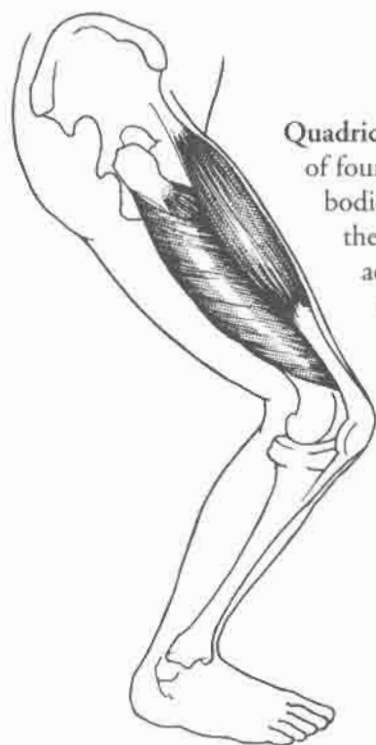
- The rotator cuff muscles, as explained above, must remain in a state of partial contraction most of the time to support the weight of the arms. The strength of these muscles must be maintained, but they must also be able to relax when the opportunity arises.
- Occasional situations require greater-than-usual strength by the arm and shoulder: lifting a heavy external object, doing push-ups, hanging from a bar.



Our general goals in regard to the shoulder:

- Strengthen the superficial muscles, each one in accordance with the specific demands of our chosen physical discipline.
- Strengthen the deep muscles in similar fashion. In addition, train these muscles to relax when the weight of the arms is being supported by other means.
- When exercising shoulder muscles which also act on the neck (e.g., trapezius), make sure that the cervical vertebrae are correctly aligned.

Muscular restrictions



Quadriceps femoris is a group of four large muscles whose bodies occupy the front of the thigh. Their primary action is extension of the knee.

The three vastus muscles originate on the femur, but the fourth muscle, **rectus femoris**, originates on the ilium. It therefore crosses the hip joint as well as the knee joint (see *AOM*, p. 217) and can act as a hip flexor when the knee is fixed.



Tension on this muscle, as in hip extension, can take the pelvis into anteversion, particularly when the knee is flexed.

This tends to reinforce ligamentary stiffness as described above, and provoke compensatory (and undesirable) lumbar arching. It is important to keep the rectus femoris flexible through proper stretching exercises, some of which are presented in the practice pages.

What are the common obstacles to this idealized, synchronized movement?

- Restricted ROM somewhere along the line. The “rolling” will stop at the restricted area.



- Failure or inability to flex the knee or hip.



- Inadequate dorsiflexion at the ankle. Body weight is not efficiently transferred to the heels. Maybe the heels don't even touch the floor.

- The muscles involved are too weak or (more commonly) poorly coordinated.

- Arches of the foot are too stiff or too high.



How can you recognize an uncushioned landing impact?

- You hear a loud noise of impact as the feet hit the floor.
- The heels do not touch the floor.
- Visually, you get an impression of stiffness or lack of coordination.

To improve articular ROMs, spend some time on the limbering exercises described in previous chapters for the hip (see p. 160), knee (p. 196), and ankle (p. 224).