# Body Mechanics

*by Joseph E. Muscolino | Art Giovanni Rimasti | Photography Yanik Chauvin*

## Stretching & Strengthening the Spinal Curves

The spine is an incredible structure. It exhibits both tremendous stability and mobility. It must be stable enough to provide the structural support for the axial body and yet also be flexible enough to allow for movement in all three cardinal planes. Indeed, the spine allows for 255 degrees of motion in the sagittal plane, 180 degrees of motion in the frontal plane, and 240 degrees of motion in the transverse plane (Figure 1). This is no easy feat because greater mobility usually comes at the expense of lesser stability; and greater stability usually means lesser mobility. The spine is able to successfully accomplish both ends of the spectrum. Much of the key to the spine's capacity for stability and flexibility lies in the structure of its curves.

*Before practicing any new modality or technique, check with your state's or province's massage therapy regulatory authority to ensure that it is within the defined scope of practice for massage therapy.*

## CURVES OF THE SPINE:

In the frontal and transverse planes, the adult spine should ideally be straight and have no curves. However, the adult spine has four sagittal plane curves: two primary kyphotic curves in the thoracic and sacrococcygeal regions, and two secondary lordotic curves in the cervical and lumbar regions (Figure 2).

A kyphotic curve, by definition, is a curve of flexion and has its convexity posterior and its concavity anterior, whereas a lordotic curve is a curve of extension and has its convexity anterior and its concavity posterior. The kyphotic curves are described as primary because they form first. In fact, when we are born, our entire spine is one large kyphotic curve. Lordotic curves form later; hence they are described as secondary. The cervical lordosis forms when an infant lifts its head to see the world; and the lumbar lordosis forms when the infant learns to sit up (Figure 3).

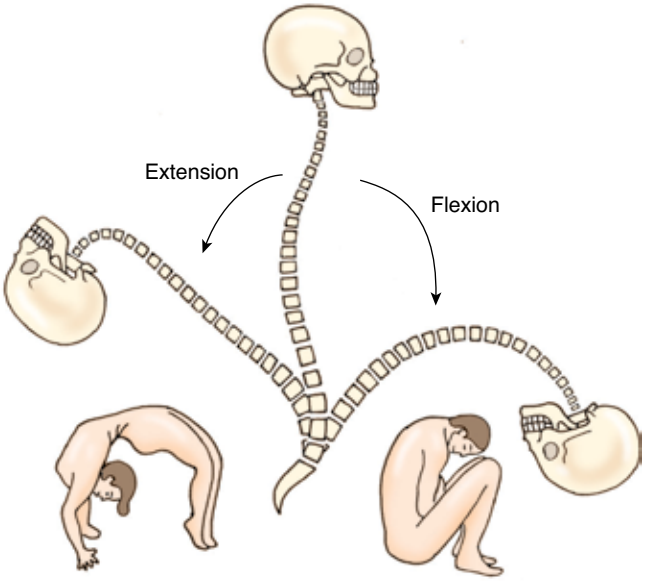


**FIGURE 1.** Sagittal plane motion of the spine. Muscolino, JE, Kinesiology: The Skeletal System and Muscle Function, 2nd Ed. Elsevier. Modeled from Kapandji, IA, Physiology of the Joints: The Trunk and the Vertebral Column, 2nd Ed. Elsevier.

## Sagittal Plane Curve Terms

There is a great deal of confusion regarding the terms used to describe the sagittal plane curves of the spine. A kyphotic curve is a kyphosis (plural: kyphoses); and a lordotic curve is a lordosis (plural: lordoses). The terms kyphosis and lordosis are often misused in that they are used to describe an individual who has an excessive kyphotic or lordotic curve. It is normal and healthy to have a kyphosis in the thoracic and sacrococcygeal regions and to have a lordosis in the cervical and lumbar regions. An excessive kyphosis should correctly be termed a hyperkyphosis or a hyperkyphotic curve; and excessive lordosis should correctly be termed a hyperlordosis or a hyperlordotic curve. Similarly, a decreased curve would be termed a hypokyphosis or hypokyphotic curve, and a hypolordosis or hypolordotic curve.

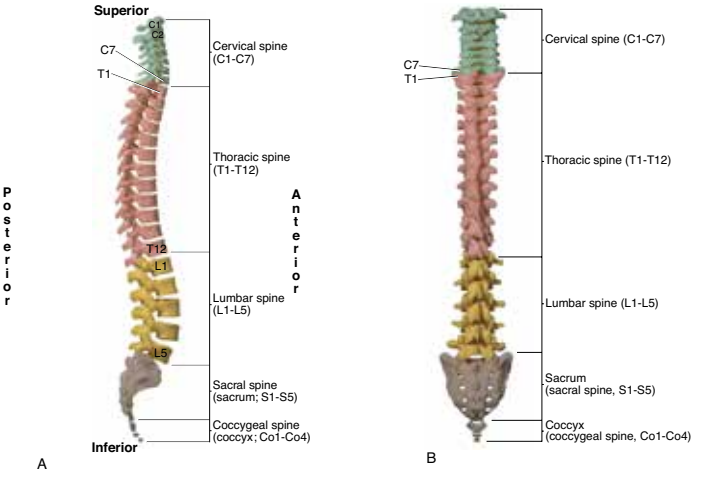


**FIGURE 2.** A, Lateral view of the four sagittal plane curves of the spine. B, Posterior view of the straight spine. Muscolino, JE, Kinesiology: The Skeletal System and Muscle Function, 2nd Ed. Elsevier.

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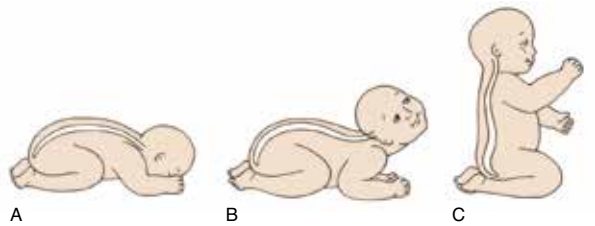


**FIGURE 3.** Kyphotic and lordotic curves of the spine. A, At birth. B, The cervical lordosis forms when we raise out head. C, The lumbar lordosis forms when we sit up. Muscolino, JE, Kinesiology: The Skeletal System and Muscle Function, 2nd Ed. Elsevier.

## ALTERED SPINAL CURVES:

Maintaining healthy spinal curves is extremely important. Any postural deviation from ideal structure may potentially cause dysfunction and/or pain. Altered curve structure can occur in all three cardinal planes.

### Sagittal Plane:

Dysfunctional postures in the sagittal plane are hyperlordotic, hyperkyphotic, hypolordotic, and hypokyphotic curves. As their names imply, hyperlordoses and hyperkyphoses are excessive lordotic and kyphotic curves respectively, and hypolordoses and hypokyphoses are decreased lordotic and kyphotic curves respectively (Figure 4). Both hyperlordotic and hypolordotic lumbar spines are common postural deviation patterns. The thoracic spine is more often hyperkyphotic than hypokyphotic, but both postural deviation patterns do occur. Note: The cervical spine is interesting in that the lower cervical spine is usually hypolordotic, but the upper cervical spine is usually hyperlordotic as a compensation to bring the head back to level. Because the sacrum is a fixed bone, it is not susceptible to postural deviation patterns.

Given that the multiple regions of the spine comprise one column, it makes sense that a postural deviation pattern in one region of the spine will usually result in a compensatory postural deviation pattern in the adjacent region. For example, it is common for a hyperlordotic lumbar spine to cause a compensatory hyperkyphotic thoracic spine, which in turn, results in a hypolordotic lower cervical spine and compensatory hyperlordotic upper cervical spine (Figure 5A). Similarly, a hypolordotic lumbar spine often results in a hypokyphotic thoracic spine, with a hypolordotic cervical spine (Figure 5B). Interestingly, a reverse lumbar curve, in other words a kyphotic lumbar spine, usually results in the same compensatory pattern as the hyperlordotic lumbar spine: a hyperkyphotic thoracic spine, a hypolordotic lower cervical spine, and a hyperlordotic upper cervical spine (Figure 5C). It should be noted that sagittal plane postural distortion of the lumbar spine is most often due to altered anterior/posterior tilt posture of the pelvis, as can be seen in Figure 5A, B and C.


FIGURE 4. A, Hyperlordotic lumbar spine. B, Healthy lumbar spine. C, Hypolordotic lumbar spine. D, Hyperkyphotic thoracic spine. E, Healthy thoracic spine. F, Hypokyphotic thoracic spine.