Fryette's Principles of Spinal Motion

Fryette's Principles of Spinal Motion (also known as Fryette's Laws) were first proposed by Harrison Fryette, DO, in 1918. Fryette found certain relationships between vertebral motion in three planes: flexion/extension, rotation, and sidebending. Law I describes vertebral motion when vertebrae are in neutral. In neutral, a vertebra will sidebend opposite its rotation. Vertebrae that are stuck in this motion pattern are said to be "Type I Somatic Dysfunctions." Type I dysfunctions occur in groups. Law II describes motion when the spine is flexed or extended. In flexion and extension, the facet joints are engaged and the vertebra sidebends and rotates to the same direction. A vertebra stuck in this motion pattern is called a "Type II Somatic Dysfunction." Type II dysfunctions are single segments, not groups. Law III was developed later by C.R. Nelson, DO, and describes the limitation of motion in one plane as other planes of motion are engaged. Fryette's Principles have been used as a model for spinal motion and spinal somatic dysfunction for over 100 years.

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Law I

Neutral Position

Neutral

Fryette's first principle details the motion of a vertebra in neutral position. Neutral position in the sagittal plane is a range between flexion and extension, where forces are transmitted primarily through vertebral bodies and intervertebral discs. The vertebral facet joints carry minimal forces in neutral, and are said to be "idling". Neutral position is assessed by palpating the vertebral transverse processes when the patient is sitting or standing straight up.

Sidebending and Rotation Occur in Opposite Directions

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When a vertebra is in neutral in the sagittal plane, sidebending and rotation (that is, motion in the coronal and horizontal planes) occur in opposite directions. For example, rotation to the right will cause sidebending to the left, i.e. the concavity of the sidebending will face left. Similarly, a neutral vertebra that sidebends to the right will subsequently rotate left.

Group Vertebral Dysfunctions

Group Vertebral Dysfunctioning

Vertebrae that are stuck in neutral are said to be "Type I" dysfunctions. Vertebral somatic dysfunctions following Type I mechanics tend to occur in groups, i.e. two or more segments. This may be due to hypertonic long restrictor muscles such as erector spinae and multifidus, which cross multiple segments and can affect the motion of a group of vertebrae. Type I dysfunctions often compensate for a pre-existing Type II dysfunction. The Type II dysfunction is frequently found at the apex of the Type I curve or at either the top or bottom of the group dysfunction. Type I dysfunctions are named for the segments involved, neutral position, sidebending and rotation. For example, T3 to T6 are Neutral, Rotated Left and Sidebent Right," or, more concisely, "T3-T6 NRLSR." Physical exam findings (tenderness, asymmetry, restricted motion, tissue texture change) for a Type I dysfunction will be present when the spine is in neutral and will not change significantly with extension or flexion of the spine.

Law II

Non-neutral Position (Flexion or Extension)

Nun-neutral

Fryette's second principle describes the motion of vertebrae in a non-neutral position, that is, in flexion or extension. In both flexion and extension, the vertebral facet joints are engaged and bearing more force than in neutral. In flexion,(as in bending forward), the anterior aspects of the vertebrae are approximating, while the posterior aspects are separating . In extension, (as in bending backward), the anterior aspects of vertebrae are separating, while the posterior aspects are approximating.

Sidebending and Rotation Occur in Same Direction

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In flexion and extension, sidebending and rotation occur in the same direction. For example, when a vertebra is flexed, rotation to the right will induce right sidebending. Recall that right sidebending means the concavity will face to the right. These same mechanics occur in extension.

Single Vertebral Dysfunctions

Single Vertebral Dysfunctioning

A vertebra that is stuck in either flexion or extension is a “Type II” dysfunction. Type II dysfunctions are either flexed or extended, but not both. Type II dysfunctions almost always involve a single vertebra. These mechanics may be caused by hypertonic short restrictor muscles, such as rotatores brevis and interspinalis, which cross only one or two vertebrae and induce motion of a single vertebra. Physical exam findings will be present when the vertebra is positioned into its barrier. For example, a vertebra that is stuck in flexion will have relatively normal findings when the spine is flexed. However, upon extension of the spine, the asymmetry, tenderness, restriction, and tissue texture change will become much more evident. Like Type I dysfunctions, Type II dysfunctions are named for the segment involved, and motion in all three planes: L4 Flexed, Rotated Right and Sidebent Right, or L4 FRSR.

Law III

Motion in One Plane Modifies Motion in Other Planes

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Law III describes the modification of spinal motion when the vertebra is moved through multiple planes of motion. This law states that a vertebra moving away from neutral in one plane of motion will have less motion in other planes. For example, a vertebra in neutral, neither flexed nor extended, can rotate through a wide range of motion. With flexion, the amplitude of rotational range of motion is reduced. With flexion and sidebending, the rotational range of motion is even more reduced. This is relevant to practitioners applying manipulative techniques to the spine. When finding the direct barriers of a dysfunctional vertebra, the practitioner will notice that the barrier of the last plane of motion will require very little motion. For example, a thoracic vertebra that is already flexed and sidebent to the direct barriers in those planes will require little rotation to complete the positioning for a direct manipulative technique. Knowing this can help practitioners prevent injury during manipulation.