

‘YOGIC THERAPY ON SPINE CURVATURE DISORDERS’

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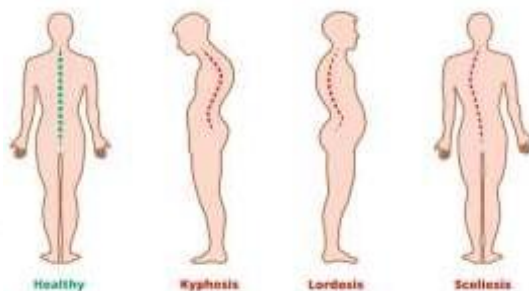
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Introduction

In today's busy schedule, people are facing many problems related to spine, so this research is necessary so that people can overcome the problem related to spine by improving their lifestyle and practicing yoga and this problem can be avoided. The spine, or backbone, is made up of small bones (vertebrae) stacked -- along with discs -- one on top of another. A healthy spine when viewed from the side has gentle curves to it. The curves help the spine absorb stress from body movement and gravity. Spine abnormalities cause misalignment of the curvature and results in spine curvature disorders like lordosis, kyphosis, and scoliosis. Due to the spine's natural and healthy curvatures, when viewed from the side, it will have a soft 'S' shape; when viewed from the front or back, it will appear straight.

The spine's healthy and natural lordosis and kyphosis work to protect the health and biomechanics of the spine by keeping it aligned. When there is a loss of one or more of these curves, it can affect the spine, and other areas of the body, in multiple ways. In a healthy spine, the vertebrae are stacked on top of one another in a healthy alignment, separated by intervertebral discs that give the spine structure, flexibility, and act as the spine's shock absorbers. When the spine loses one or more of its natural curvatures, the spine is no longer optimally aligned, and this is when problems occur. Spine: Since this is where the scoliosis, kyphosis and lordosis are located, they are important to focus on lengthening the spine, which tends to reduce the spinal curve. When viewed from the back, the spine should run straight down the middle of the back. When abnormalities of the spine occur, the natural curvatures of the spine are misaligned or exaggerated in certain areas, as occurs with lordosis, kyphosis, and scoliosis.

1. Kyphosis– Kyphosis is featured by an abnormal round upper back. i.e. over 50 degrees curvature.
2. Lordosis– This is also known as swayback. The spine of an individual having lordosis curves inward significantly at lower back
3. Scoliosis– An individual with scoliosis has a curve sideways to the spine. This curve is often C-shaped or S-shaped.



Back pain affects and its Therapeutic options

Back pain affects 80% of the population and total expenses approach \$26 billion annually. Therapeutic options within conventional medical practice are limited to analgesics, educational materials, and physical therapy. Patients with significant long-term disability and requiring opiate analgesia may be referred to multi-disciplinary pain treatment centers that provide an array of therapeutic options including cognitive-behavioral therapy, group support, individual psychological counseling, epidural steroid injections, implantable pain pumps and spinal cord stimulator devices and other non-convention therapies such as chiropractic, massage, acupuncture,, yoga, tai chi, meditation, relaxation exercises, Pilates, and Feldenkrais.

Importance of it in our daily life

Essentially, yoga therapy is the application of yoga practices to alleviate physical and mental health conditions with the view of promoting self-care and encouraging overall well-being. Whilst the practice of yoga in general aims to cultivate the body and mind and hence has the potential for therapeutic effects, in yoga therapy we are using specific yoga practices and their known benefits to help alleviate or improvement mental and physical ailments. The modern term, 'Yoga therapy' was coined by Swami Kuvalyananda in the 1920s who believed the changes it would be possible to measure the physical and physiological changes that occurred through yoga practice. His passion brought foreigner researchers to India to study yoga's effect, a magazine, an entire yoga institution and a new field. Swami Kuvalyananda made it possible to start applying the specific effects of yoga to medical conditions.

Concept of Spine Curvature Disorders

The spine, or backbone, is made up of small bones (vertebrae) stacked -- along with discs -- one on top of another. A healthy spine when viewed from the side has gentle curves to it. The curves help the spine absorb stress from body movement and gravity. Spine abnormalities cause misalignment of the curvature and results in spine curvature disorders like lordosis, kyphosis, and scoliosis. Due to the spine's natural and healthy curvatures, when viewed from the side, it will have a soft 'S' shape; when viewed from the front or back, it will appear straight. Spine: Since this is where the scoliosis, kyphosis and lordosis are located, they are important to focus on lengthening the spine, which tends to reduce the Spinal curve. When viewed from the back, the spine should run straight down the middle of the back. When abnormalities of the spine occur, the natural curvatures of the spine are misaligned or exaggerated in certain areas, as occurs with lordosis, kyphosis, and scoliosis.

Types of spine curvature disorders

There are many different types of spinal conditions a person can develop. Some involve an over- or under-pronounced natural curvature, while others involve an unnatural sideways spinal curve that also rotates. The spine's natural curves are important for facilitating its strength, flexibility, and ability to evenly distribute stress. While there is a normal range of natural curvatures, when curves fall beyond these normal ranges, conditions such as lordosis, kyphosis, and scoliosis can be the cause. There are three main types of spine curvature disorders, including: **Lordosis** – Also called swayback, the spine of a person with lordosis curves significantly inward at the lower back. **Kyphosis** – Kyphosis is characterized by an abnormally rounded upper back (more than 50 degrees of curvature). **Scoliosis** – A person with scoliosis has a sideways curve to their spine. The curve is often S-shaped or C-shaped.

Common causes of lordosis

- Lordosis can affect people of any age. Certain conditions and factors can increase your risk for lordosis. This includes:
- Spondylolisthesis: Spondylolisthesis is a spinal condition in which one of the lower vertebrae slips forward onto the bone below. It's usually treated with therapy or surgery. Find out more about the condition here.
- Achondroplasia: Achondroplasia is one of the most common types of dwarfism. Learn about its causes, diagnosis, and treatment.
- Osteoporosis: Osteoporosis is a bone disease that causes a loss of bone density, which increases your risk of fractures. Learn about its causes, symptoms, and treatments.
- Osteosarcoma: Osteosarcoma is a bone cancer that typically develops in the shinbone near the knee, the thighbone near the knee, or the upper arm bone near the shoulder. Read more about symptoms, diagnosis, and treatments.
- Obesity: Obesity is an epidemic in the U.S. This condition puts people at a higher risk for serious diseases, such as type 2 diabetes, heart disease, and cancer. Learn about obesity here.

The following conditions can cause lordosis:

- Achondroplasia. A disorder in which bones do not grow normally, resulting in the short stature associated with dwarfism
- Spondylolisthesis. A condition in which a vertebrae, usually in the lower back, slips forward
- Osteoporosis, a condition in which vertebrae become fragile and can be easily broken (compression fractures)
- Obesity, or being extremely overweight
- Kyphosis. A condition marked by an abnormally rounded upper back
- Discitis. Inflammation of the disc space between the bones of the spine most often caused by infection
- Benign (harmless) juvenile lordosis
- Spine – Natural factors of how spines are formed greatly increase certain individuals' likelihood to experience a strain or sprain in their back or neck. Factors such as having more lumbar vertebrae allowing for too much flexibility, and then in cases of less lumbar the individual not reaching their necessity for flexibility and then pushing their bodies to injury.
- Legs – Another odd body formation is when an individual has a leg shorter than the other, which can be an immediate cause for the imbalance of hips then putting strain on the posture of the back which an individual has to adjust into vulnerable positions to meet aesthetic appearances. This can lead to permanent damage to the back. Genu recurvate (swaying back knees) is also a factor that forces a dancer to adjust to unstable postures.
- Hips – Common problems in the hips are tight hip flexors, which causes poor lifting posture, hip flexion contracture, which means the lack of postural awareness, and thoracic hyper kyphosis, which causes the individual to compensate for limited hip turn out (which is essential to dances such as ballet). Weak psoas (short for iliopsoas-muscle that controls the hip flexor) forces the dancer to lift from the strength of their back instead of from the hip when lifting their leg into arabesque or attitude. This causes great stress and risk of injury, especially because the dancer will have to compensate to obtain the positions required.
- Muscles – One of the greatest contributors is uneven muscles. Because all muscles have a muscle that works in opposition to it, it is imperative that to keep all muscles protected, the opposite muscle is not stronger than the muscle at risk. In the situation of lumbar lordosis, abdominal muscles are weaker than the muscles in the lumbar spine and the hamstring muscles. The muscular imbalance results in pulling down the pelvis in the front of the body, creating a swayback in the spine.
- Growth spurt – Younger dancers are more at risk for the development of lumbar hyper lordosis because the lumbar fascia and hamstrings tighten when a child starts to experience a growth spurt into adolescence.

Symptoms of lordosis may include:

- Appearing swayback, with the buttocks being more pronounced
- Having a large gap between the lower back and the floor when lying on your back on a hard surface that does not change when you bend forward
- Back pain and discomfort
- Problems moving certain ways.
- The most common symptom of lordosis is muscle pain. When your spine curves abnormally, your muscles get pulled in different directions, causing them to tighten or spasm. If you have cervical lordosis, this pain may extend to your neck, shoulders, and upper back. You may also experience limited movement in your neck or lower back.
- You can check for lordosis by lying on a flat surface and checking if there's a lot of space between the curve of your neck and back and the floor. You may have lordosis if you can easily slide your hand through the space.

Diagnosed

Your doctor will look at your medical history, perform a physical exam, and ask about other symptoms to help determine if you have lordosis. During the physical exam, your doctor will ask you to bend forward and to the side. They're checking:

- Whether the curve is flexible or not
- Your range of motion
- If your spine is aligned
- If there're any abnormalities
- They may also ask questions like: When did you notice the excessive curve in your back?
- X-ray, a diagnostic test that uses electromagnetic energy beams to produce images of internal tissues, bones, and organs. Your child's doctor will use the x-ray to determine the degree of your child's spinal curvature.
- CT or CAT scan (computerized tomography scan), a diagnostic imaging procedure that uses a combination of x-rays and computer technology to produce cross-sectional images of the body. CT scans show detailed images of any part of the body, including the bones, muscles, fat, and organs and are more detailed than general x-rays.
- MRI (magnetic resonance imaging), a diagnostic procedure that uses a combination of large magnets, radio frequencies, and a computer to produce detailed images of organs and structures within the body.
- Bone scan, an imaging method used to determine the cause of bone pain or inflammation, evaluate changes in the joints, and detect bone diseases and tumors.
- Blood tests are sometimes used to look for associated metabolic conditions. They are not a standard part of diagnosing lordosis, however.
- After narrowing down the possible causes, your doctor will order tests, including X-rays of your spine to look at the angle of your lordosis curve. Your doctor will determine if you have lordosis based on the angle in comparison to other factors like your height, age, and body mass

Kyphosis

The term is from Greek a hump. Kyphosis is an excessive curve of your spine and may be called "hunchback" or "round back." Kyphosis (postural) appears more often in teenagers, whose bones are growing rapidly. But it can develop in anyone. It may also develop in older adults. As people age, the vertebrae lose flexibility, and their spine may begin to tilt forward. You can also be born with (congenital) the condition. Kyphosis is an abnormally excessive convex curvature of the spine as it occurs in the thoracic and sacral regions. Abnormal inward concave lordosis curving of the cervical and lumbar regions of the spine is called lordosis. It can result from degenerative disc disease; developmental abnormalities, most commonly Schumann's disease; Copenhagen disease, osteoporosis with compression fractures of the vertebra; multiple myeloma; or trauma. A normal thoracic spine extends from the 1st thoracic to the 12th thoracic vertebra and should have a slight kyphotic angle, ranging from 20° to 45°.

Congenital kyphosis

- Congenital kyphosis occurs when an infant's spine develops abnormally in the womb. For example, vertebrae may be misshapen or fused together.
- Patients with congenital kyphosis typically require corrective surgery early in life and may have additional birth defects affecting the heart and kidneys.
- Congenital kyphosis refers to abnormal development of the spine that is inherited. This means a person is born with some sort of defect, such as incomplete formation of the spine, which can lead to a severe abnormal kyphosis. This kyphosis is also the most common non-traumatic, non-infectious cause of paraplegia (paralysis of the lower part of the body).
- With congenital kyphosis, there is a strong (20-30%) association of congenital abnormalities with the body's urinary collecting system. If this type of kyphosis is suspected, your doctor may suggest that you have an IVP (a type of X-ray that looks at the kidneys), a myelogram, or an MRI done. The myelogram and the MRI scan are done to make sure that the parts of the spine have developed normally.
- Treatment for severe congenital kyphosis deformities is usually surgery. If necessary, early surgical

intervention generally produces the best results and can prevent progression of the curve. The type of surgical procedure will depend on the nature of the abnormality.

- Conservative (non-surgical) treatment plans are less successful at correcting this type of kyphosis. If non-surgical treatment is chosen, there is a critical need for observation and close medical follow-up to prevent serious problems later.

Causes

- In kyphosis, the normal curve in the middle section of vertebral column (the thoracic vertebrae) is more curved than normal. There are a number of reasons why this might happen, including:
- Poor posture (postural kyphosis) – slouching, leaning back in chairs and carrying heavy bags can stretch supporting muscles and ligaments, which can increase spinal curvature
- Abnormally shaped vertebrae (Schumann’s kyphosis) – if the vertebrae don’t develop properly, they can end up being out of position
- Abnormal development of the spine in the womb (congenital kyphosis) – if something disrupts the spine’s normal development, two or more vertebrae sometimes fuse together
- Age – as people get older, their spinal curvature can increase
- Kyphosis can also develop as a result of a spinal injury.
- Nutritional kyphosis can result from nutritional deficiencies, especially during childhood, such as vitamin D deficiency (producing rickets), which softens bones and results in the curving of the spine and limbs under the child’s body weight.
- Gibbous deformity is a form of structural kyphosis, often a *sequela* to tuberculosis.
- Post-traumatic kyphosis can arise from untreated or ineffectively treated vertebral fractures.

Symptoms of Kyphosis

The following are the most common symptoms of kyphosis. However, each individual may experience symptoms differently. Symptoms may include:

- Difference in shoulder height
- The head bends forward compared to the rest of the body
- Difference in shoulder blade height or position
- When bending forward, the height of the upper back appears higher than normal
- Tight hamstrings (back thigh) muscles
- Back pain may be present, but rarely is it significant enough to impact normal activity
- Parents and loved ones may comment on the child’s “poor posture” or use the words “humpback” or “hunchback” to describe the child’s posture.
- Fatigue
- Mild back pain
- Rounded upper back
- Spine tenderness and/or stiffness
- In more severe cases, patients report shortness of breath, chest discomfort or pain, and/or numbness, weakness and/or tingling in the legs.

Diagnosed

The doctor makes the diagnosis of kyphosis with a complete medical history, physical examination and diagnostic tests. If the patient is a child, the doctor obtains a complete prenatal and birth history of him or her and asks if other family members are known to have kyphosis. The doctor will also ask about developmental milestones, since some types of kyphosis can be associated with other neuromuscular disorders. Developmental delays may require further medical evaluation. Diagnostic procedures may include the following:

- **X-rays.** A diagnostic test that uses invisible electromagnetic energy beams to produce images of internal tissues, bones and organs onto film. This test is used to measure and evaluate the curve. With the use of a standing lateral, full-spine X-ray, the doctor or radiologist measures the angle of the spinal curve. A curve greater than 50 degrees is considered abnormal or hyper kyphosis.

- Early detection of kyphosis is important for successful treatment. Pediatricians or family doctors, and even some school programs, routinely look for signs that kyphosis may be present. A spine specialist can determine if your kyphosis requires treatment. The evaluation includes:
- Your medical and family history
- An in-depth physical and neurological examination
- Imaging tests such as X-rays computed tomography (CT) scan, or magnetic resonance imaging (MRI)

Scoliosis

In the simplest terms, scoliosis is a curvature of the spine. It appears in prehistoric cave paintings and was first treated with braces by the Greek physician Hippocrates in the fourth century B.C. In fact, the word “scoliosis” derives from the Greek word skol, which means twists and turns. Not only does scoliosis create spinal deformity, it displaces the ribs, twists the shoulders and hips, and shifts the body’s center of gravity.

In scoliosis, instead of following a straight line along the length of the back, the spine forms an S curve (or reversed S) from side to side down the back. At the same time, the back of the spine rotates toward the concave side of the S, twisting the rib cage and making the sides of the back uneven. (To observe this effect, bend a hose into an S shape and observe how it rotates at the same time.) When this curvature occurs near the middle of your back, the ribs compress on the concave side of the spine and spread apart on the convex side. On the concave side, the attached ribs push sideways and forward, while on the convex side, they collapse toward the spine and move back, forming a rotation of the rib cage characteristic of the condition. The ribs on the convex side often protrude to the back; frequently, a tense, painful mass of muscle tissue develops over those bones. The most obvious symptoms of scoliosis are cosmetic—your body is visibly crooked—but pain and cardiopulmonary complications (due to compression of the heart and lungs) are also common.

What is Yoga Therapy?

According to the International Association of Yoga Therapists:

“Yoga therapy is the process of empowering individuals to progress toward improved health and well-being through the application of the teachings and practices of Yoga.” Essentially, yoga therapy is the application of yoga practices to alleviate physical and mental health conditions with the view of promoting self-care and encouraging overall well-being. Whilst the practice of yoga in general aims to cultivate the body and mind and hence has the potential for therapeutic effects, in yoga therapy we are using specific yoga practices and their known benefits to help alleviate or improvement mental and physical ailments

The modern term, ‘Yoga therapy’ was coined by Swami Kuvalyananda in the 1920s who believed the changes it would be possible to measure the physical and physiological changes that occurred through yoga practice. His passion brought foreigner researchers to India to study yoga’s effect, a magazine, an entire yoga institution and a new field. Swami Kuvalyananda made it possible to start applying the specific effects of yoga to medical conditions. These days yoga therapy has become so popular, that many doctors are now supporting it. Various medical journals reveal research as to yoga’s multi-tiered benefits. Likewise those in the field of mental health often recommend yoga to clients or may even integrate aspects into their work. At The Minded Institute we train many mental health professionals to bring yoga therapy into clinical practice. In fact, yoga therapy the evidence and support of yoga therapy is so great that in the USA cardiologist, Dr. Dean Ornish developed a yogic based intervention that can reverse heart disease. His program was so successful that it is now covered by public health insurance! Likewise in the UK, the NHS is now also becoming increasingly aware of the potential benefits of yoga therapy to their staff and patients alike and they recommend the British Council of Yoga Therapists in the Complementary and Alternative Therapies element of their service.

Yoga therapy is a form of therapy that uses yoga practices to help individuals improve their physical, mental, and emotional well-being. Yoga therapy is based on the belief that the mind and body are interconnected and that by using yoga practices, individuals can achieve a sense of balance and harmony. Yoga therapy is often used as a complementary therapy to conventional medical treatments. It is also used as a standalone therapy for a range of health conditions, including chronic pain, anxiety, depression, and insomnia. Yoga therapy can also be used to manage symptoms associated with a range of medical conditions, including cancer, heart disease, and

diabetes. Yoga therapy can be practiced in a variety of settings, including private studios, community centers, hospitals, and rehabilitation centers. Yoga therapists are trained to work with individuals with a range of health conditions and are skilled at adapting yoga practices to meet the specific needs of each individual. The practice of yoga therapy often involves a combination of physical postures (asanas), breathing techniques (pranayama), and meditation practices. The focus of yoga therapy is on the individual and their unique needs, so the practices used may vary depending on the individual's health condition, age, and fitness level. One of the benefits of yoga therapy is that it is a non-invasive and non-pharmacological form of therapy. Unlike conventional medical treatments, yoga therapy does not involve the use of drugs or invasive procedures. Instead, it uses natural practices to promote health and well-being.

Physiology of Spine curvature disorders

Spine curvature disorders are conditions in which the normal curvature of the spine is altered, resulting in abnormal curvatures of the spine. The most common spine curvature disorders are scoliosis, kyphosis, and lordosis. These disorders can be caused by various factors, including genetics, neuromuscular conditions, and poor posture. Physiologically, spine curvature disorders can affect the spinal cord, nerves, and muscles. In scoliosis, the curvature of the spine can cause the vertebrae to rotate, leading to uneven pressure on the discs between the vertebrae. This can result in pain, stiffness, and reduced mobility. In kyphosis, the excessive curvature of the thoracic spine can lead to compression of the lungs and decreased respiratory function. This can cause shortness of breath, fatigue, and other respiratory problems.

In lordosis, the excessive curvature of the lumbar spine can lead to increased pressure on the discs and facet joints. This can cause lower back pain, stiffness, and reduced mobility. In all spine curvature disorders, there may be muscle imbalances and weakness, which can further exacerbate the problem. Physical therapy and exercise can help strengthen the muscles around the spine and improve posture, which can alleviate symptoms and improve function. In severe cases, surgery may be necessary to correct the curvature of the spine. Spine curvature disorders, also known as spinal deformities, refer to conditions that affect the alignment and shape of the spine. The most common types of spine curvature disorders are scoliosis, kyphosis, and lordosis. Scoliosis is a lateral curvature of the spine, where the spine curves sideways, resembling an "S" or "C" shape. Kyphosis is a forward curvature of the spine, leading to a hunchback appearance. Lordosis, on the other hand, is an inward curvature of the spine, causing an exaggerated arch in the lower back.

The causes of spine curvature disorders are not always clear, but they may be related to a variety of factors such as genetics, neuromuscular conditions, birth defects, or poor posture. Physiologically, spine curvature disorders can affect the spine and surrounding structures, including the muscles, ligaments, and nerves. The curvature can lead to muscle imbalances, which can result in pain, weakness, and stiffness. Over time, these imbalances can also lead to degenerative changes in the spine, such as arthritis and disc degeneration. In severe cases, spine curvature disorders can also affect lung function and reduce the amount of space in the chest cavity, leading to breathing difficulties. In addition, spinal deformities can cause psychological distress and impact a person's self-esteem and body image. Treatment for spine curvature disorders depends on the severity of the curvature and the age of the patient. Mild cases may be managed with exercises and physical therapy, while more severe cases may require bracing or surgery. Early diagnosis and treatment can help to prevent the progression of the curvature and improve overall quality of life.

Congenital Kyphosis

Congenital kyphosis is an uncommon sagittal plane deformity, which, if left untreated, is often associated with a neurologic deficit.³⁵ As with congenital scoliosis, congenital kyphosis is caused by segmentation failure. Winter and colleagues³⁶ classified congenital kyphosis into three types: type I is the failure of formation of the vertebral body; type II is the failure of segmentation of the vertebral body, resulting in a ventral unsegmented bar; and type III is the mixed failure of formation and segmentation. The type I kyphosis is the most common and the most likely to lead to both severe deformity and neurologic compromise.³⁶ The severity of type I kyphosis is directly proportional to the amount of vertebral body or bodies that fail to form. The type II kyphosis is less common, produces less severe deformity, and is much less frequently associated with neurologic compromise than type I. The amount of kyphosis produced is proportional to the discrepancy between the ventral vertebral growth and the growth of the dorsal elements. Type III kyphosis is very rare and probably behaves like type I kyphosis.

Kyphosis

Kyphosis is a physiologic thoracic anterior concave spinal curvature in the sagittal plane, associated with cervical and lumbar lordosis in a physiologic conformation of the spine. Physiologic values for kyphosis during growth are between 20 to 25 degrees and 40 to 45 degrees. Sagittal plane alterations affect sagittal spinal curves in terms of both quantity and distribution. Thus, hyper kyphosis (HK), which is defined as an increase of the kyphosis, can be distinguished between high thoracic, thoracic, thoracolumbar, and lumbar HK according to the level where the apex of the curve can be identified.¹⁰ Concerning the sagittal spinal profile, it is also important to distinguish alterations such as long kyphosis, normal kyphosis with a caudal vertebra below T12, and junctional kyphosis, flat back with distal kyphosis with caudal vertebrae below T12. An association between scoliosis and one of these sagittal deformities is possible.

Thoracic kyphosis

Thoracic kyphosis remains fairly constant in adult men and women until somewhere about age 40 years. After age 40 years, thoracic kyphosis begins to increase in both men and women, with a more marked increase in women across the remainder of the life span. Excessive thoracic kyphosis (hyper kyphosis) is a commonly observed postural dysfunction in older adults, particularly older women. A thoracic kyphosis angle greater than 40 degrees exceeds the 95th percentile value of thoracic kyphosis angle in young adults and, thus, may serve as a possible cutoff for hyper kyphosis. Multiple researchers have associated clinically symptomatic hyper kyphosis with advancing age, often linking increasing kyphosis with increasing functional limitations, decreased participation in outside activities, and lower self-reported health and life satisfaction. In addition, significant correlations have been demonstrated between fall risk and kyphosis. Although clinical kyphosis alone is not linearly predictive of either osteoporosis or vertebral fractures, an association does exist, and has been demonstrated to be most prominent in women with multiple thoracic vertebral compression fractures (VCF). It has also been demonstrated that a composite risk score using calcaneal qualitative trigonometry and kyphosis had better discriminatory power than low dual-energy x-ray absorptiometry bone mineral density to predict prevalent vertebral fractures in community-dwelling women.

Pathological changes in structure and function in response to asymmetric loading: cause and effect

The bony axis of the human spine, which by itself cannot tolerate a weight of > 10 kilograms without buckling, depends for stability on a balanced muscular system coordinated by the CNS. The effects of gravity on the upright human posture are powerful: Once a curvature develops, unequal compression on vertebral plates results in unequal growth, which in turn contributes to the progression of the deformity. Asymmetrical changes in rib and vertebral structure and function predictably follow from the asymmetric stresses applied in a spinal curvature. For any kind of machinery from a misaligned automobile to a human spine, asymmetrical loading constitutes a 'vicious cycle' which tends to perpetuate itself: The more unbalanced the load, the more likely it will become even more unbalanced over time under the relentless influence of gravity.

Molecular, cellular, and clinical predictions of the 'Vicious Cycle' model

The 'vicious cycle' model is of value for its potential to bridge basic science and clinical applications by generating predictions that can be quantified in the laboratory, in individuals over time, and among patient populations. Research to explore this hypothesis has addressed the fundamental questions of how the spine is loaded when scoliosis is present, how growth responds to this altered load, and how much of scoliosis progression in the coronal ('frontal') plane can be attributed to mechanically modulated growth. The results, summarized below, support the premise that lateral spinal curvature results in asymmetric loading which, in turn, affects gene expression underlying the structure and function of growth plates within the spine. These changes, in turn, foster the development and progression of scoliosis. An equal balance of compression on growth plates of a symmetrically loaded vertebral column yields a straight spine. These changes, in turn, foster the development and progression of scoliosis. An equal balance of compression on growth plates of a symmetrically loaded vertebral column yields a straight spine. Unrelieved contrasting forces on each of the two sides of a vertebral growth plate, however, quickly produce within vertebrae and intervertebral discs a wedged deformity whose magnitude can account for most if not all of the lateral curvature that develops in a progressive scoliosis. Even spinal curvatures due to CNS injury in infancy may remain stable throughout most of childhood, but worsen markedly during the period of rapid growth at adolescence. Differences in progression among individual patients may stem from divergence in muscle activation strategies rather than an inherent deficiency in structure and function within the spine. Such differences in muscle activation strategies might also explain the observation that simple 'side shift' exercises were correlated with curvature stabilization in two groups of patients at high risk of progression, by

transient repeated reversal of asymmetric loading. Continuous steady state loading inhibits growth but transient loading apparently does not.

Therapeutic Yoga

Applying the practices of yoga to help alleviate health conditions and promote holistic wellbeing. Along with its sister discipline Ayurveda, yoga has been practised therapeutically for thousands of years. Krishnamacharya – known as the father of modern yoga – often integrated therapeutic elements into yoga. B.K.S Iyengar also suggested poses for the treatment of asthma, high blood pressure and diabetes in his book, *Light on Yoga*. Iyengar was just one of many teachers that advocated the use of yoga for a number of common ailments.

Therapeutic yoga has emerged as a discipline of its own. In a therapeutic class, a teacher will tailor practices for different health conditions. These conditions can range from physical ailments through to emotional distress. This style of yoga takes a whole body or holistic approach. This considers the overall health, physical, mental and emotional condition of an individual. It then adapts to and works with whatever limitations are present.

Yoga as therapy includes multiple components

Yoga is a form of mind-body fitness that involves a combination of muscular activity and an internally directed mindful focus on awareness of the self, the breath, and energy. Four basic principles underlie the teachings and practices of yoga's healing system. The first principle is the human body is a holistic entity comprised of various interrelated dimensions inseparable from one another and the health or illness of any one dimension affects the other dimensions. The second principle is individuals and their needs are unique and therefore must be approached in a way that acknowledges this individuality and their practice must be tailored accordingly. The third principle is yoga is self-empowering; the student is his or her own healer. Yoga engages the student in the healing process; by playing an active role in their journey toward health, the healing comes from within, instead of from an outside source and a greater sense of autonomy is achieved. The fourth principle is that the quality and state of an individual's mind is crucial to healing. When the individual has a positive mind-state healing happens more quickly, whereas if the mind-state is negative, healing may be prolonged.

Which is widely acknowledged as the authoritative text on yoga. Today, many people identify yoga only with asana, the physical practice of yoga, but asana is just one of the many tools used for healing the individual; only three of the 196 sutras mention asana and the remainder of the text discusses the other components of yoga including conscious breathing, meditation, lifestyle and diet changes, visualization and the use of sound, among many others. In *Yoga Sutras*, Patanjali outlines an eightfold path to awareness and enlightenment called *ashtanga*, which literally means “eight limbs”.

In a therapeutic yoga practice, the specific tools for healing include yoga poses (Asanas), breath work (pranayama), and meditation. Sometimes, yoga as therapy might even include hand gestures (mudra) and vocal tones (mantra). All of these tools are tailored to your specific goals and therapeutic needs.

Specific Asanas for spine pain

Even exercise -based yoga interventions differ from purely gymnastic exercises in that yoga practitioner focuses his/her's mind on the postures with inner awareness. All postures must be performed in a consciously aware manner that is fully appreciative of the intricacy of each movement. These movements are “intricate” and highlight the body – mind nature of yoga that emphasizes awareness, concentration, and bidirectional communication between the mental, nervous, skeletal, and muscular systems. Yoga is regarded as a safe method and a therapy that provides a wide range of benefits. Among the innumerable yoga Asanas, there are some, which work specially on spine. These Asanas help in relaxing the tight muscles, reducing the tension and strengthening them. Yoga practices these Asanas along with pranayama, correcting the vertebral curvatures, with respective angles, strengthening thoracic and abdominal cavities along with respiratory muscles supporting the maintenance of proper posture.

Analyzing papers reviewed in this article, the below listed yoga postures have been identified as common specific Asanas designated to reduce spinal pain (back and neck) consistently mentioned in the studies which revealed the details of intervention Program.

- Yogasana reduce stiffness, increase flexibility of the spine and reduces back pain.
- Yogasana are practiced with deep internal awareness and relaxation helps to erase deep-seated stress.
- When the final posture of the asana is maintained with relaxation, the deeper corrections take place. The pran

blocks are diffused, giving a great sense of freedom from a stiff back.

- Yogasana practices reduce pain by endorphin (Natural Pain Killer) production at a cortical level of brain.

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|-------------------------|----------------------------|
| 1. Tadasana | 8. Utthita Parsvakonasana |
| 2. Ardha Uttanasana | 9. Prasarita Padottanasana |
| 3. Chair Bharadvajasana | 10. Supta Padangustasana |
| 4. Adho Mukho Virasana | 11. Prone Savasana |
| 5. Adho Mukha | 12. Supta Pavanamuktasana |
| 6. Utthita Trikonasana | 13. Supta Savasana |
| 7. Virabhadrasana | |

Pranayama -

- Pranayama practices remove the carbon dioxide from the body and cleanse the system.
- Pranayama practices correct the rhythm of breathing by synchronizing body movements withinhalation and exhalation.
- Pranayama is a unique method for balancing the autonomic nervous system.
- Pranayama practices reduce breath frequency to master emotional surges, and increase deep internalawareness in preparation for meditation.
- Research done on Pranayama has shown that specific pranayama practices can have a relaxingeffect on the sympathetic nervous system, reduce stress levels, and thereby reduce back pain.
 1. Bhastrika pranayama
 2. Kapalbhati
 3. Anuloma-viloma pranayama

MUDRA

Mudra science is an ancient science that which connects certain energy-flows in mind body system. The literal meaning of mudra is the expression of internal feelings by way of different postures of fingers, palms, hands feet and or body. This is an integral part of yoga and a scientific knowledge of spirituality and physical well. Mudra involve the entire body, by doing mudras, subtle hand and finger movements make important connections in the nervous system and stimulate specific energy pathways. These mudras (hand postures) have potential benefits for physical, mental and emotional wellbeing. Mudras help to Stimulates the brain, works on the nervous system, helps in relieving stress, improves concentration and lastly, it gives you a peaceful mind. Help to deficiency of vitamins and minerals are cured permanently.

1. China Mudra
2. Akash mudra
3. Prithivi Mudra

MEDITATION

People's eyes tend light up when they hear the term yoga nidra (sometimes referred to as "sleep with awareness" or "the sleep of awakening"). They are often enthusiastic about lying down, perhaps because they may be envisioning guided relaxations, such as the one I'm going to share with you, being somewhat like nice, long naps. However, even though the mind and body are at rest, yoga nidra involves conscious attention, which there is none of when we are actually sleeping.

The practice also has healing and transformative powers that can affect mind, body, and awareness. With that in mind, I designed this "yoga nidra for chronic pain" practice to help the many people in my life looking for ways to cope with chronic back pain. yoga nidra creates a space in your mind, opening a window into your soul which helps you connect with your inner self. It is a pathway to a free mind that helps you get rid of negative thoughts or events. As you practice yoga nidra, you'll start to let go of all the unwanted energies. yoga nidra combines breath awareness, guided imagery, and body sensing for the purpose of inducing a deep sense of peace. It can even be used to manifest intentions (sankalpas). At its pinnacle, yoga nidra leads to a state of awareness known as pure consciousness. Whatever the goal of a particular yoga nidra practice, feeling refreshed and rejuvenated is often the outcome.

Diet for Scoliosis

The following food items provide excellent nutrition and improve the body's ability to recover successfully from scoliosis. They promote greater strength, stamina and energy, which helps scoliosis patients build more active and capable bodies. And they are excellent for everyone, regardless of whether they deal with scoliosis or not — the whole family can get on board.

1. Fresh Fruits and Vegetables
2. Non Processed Meats
3. Foods Containing Calcium and Vitamin D
4. Water

DIET FOR LORDOSIS

The foods which counteract against inflammation are those who have a high amount of antioxidants, unsaturated fats and lean type of proteins. Meals that contain these qualities are present in the Mediterranean diet, which contains plenty of fish, fruit, whole grains, olive oil and raw vegetables. You must include the following types of food in your daily meal.

1. Tuna and salmon fish are the richest source of omega-3 fatty acids. You must include two or three servings of omega-3 fatty acids rich fish in each week.
2. Beans, (e.g. kidney beans), grains, seeds, pulses and nuts must be part of your daily food.
3. Eggs and poultry may be taken after every one day.
4. Consumption of red wine is permitted. One glass per day provides a healthy amount of antioxidants.
5. Root vegetables like carrots, beets, sweet potatoes, fruits like cherries, grapes, berries, as well as herbs and spices such as cinnamon, garlic and ginger are the types of food which are nutrition rich and reducing back pain.

DIET FOR KYPHOSIS

While deficiencies in vitamin D3, calcium and phosphorous can be linked to increased kyphosis risk, the answer is more complex than simply feeding more of those nutrients, Bergstrom says. The relationships between minerals play an important role. "The importance of phosphorus, calcium, certain trace minerals, and their interactions are sometimes overlooked".

Conclusion

In today's time, people are facing a lot of spine related problems due to the run-of-the-mill life of the person and due to the wrong lifestyle. The easiest and best, without any problem, the best therapy for this problem is yoga therapy. This research study suggests that yogasanas, pranayama, mudras, meditation and diet are the therapy for people suffering from spine curvature disease.

The results suggest that yoga exercises can affect the shape of the anterior-posterior curves of the spine. The study findings demonstrated high efficiency of CDSS developed for personalized surgical treatment of patients with degenerative lumbar spine diseases taking into consideration individual biometric parameters of lumbar segments. The main finding of this review suggests that the practice of yoga can decrease pain and increase functional ability in patients with spinal pain. High correction bracing seems to have a positive effect on the curve and on chronic low back pain in patients with a scoliosis and a Lenke 5C curve pattern. The unbiased literature review has revealed poor quality evidence supporting the use of exercise therapy in the treatment of AIS. Well-designed randomized controlled studies are required to assess the role of exercise therapy in spine curvature. Various treatment approaches have been used to treat scoliosis based on conservative approach. It is suggested that the efficiency of various methods be evaluated based on available literature. Low back pain can be prevented in a majority of cases, provided maintaining of correct posture, regular and proper exercises, intake of proper selections of food and preserving proper mental health are all followed. Causes of back pain are understood as multifactorial. Highly successful management of multifactorial disease depends on multi-focus treatment approach. Since yoga is a holistic method, it is equipped with multi-target approaches. Hence, testified successful results have been obtained.

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