

# Spinal Disc Rehabilitation Procedures & Whole-Body Vibration

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# Spinal Disc Rehabilitation Procedures & Whole-Body Vibration

## Introduction

The restoration of spinal form and function is a complicated process. It is not just one protocol for temporary symptom relief, but a systems approach to achieve a long-term and positive result. Injuries and/or displacements of the spine require special treatment in the proper sequence to restore its form and function. The role of water intake, supplements, warm-up stretching exercises, force-over-time traction, isometric-demand exercises, and the use of controlled vibration in modern treatment cannot be refuted. Individual therapies used by themselves and/or out of order may be harmful and are of little benefit in restoration of spinal soft- and hard-tissue form and function. Understanding and using proven protocols is appealing.

The importance of non-invasive correction of spinal form and function is evident when considering the following statement from orthopedic surgeons, Anthony DePalma, M.D., and Richard Rothman, M.D., Ph.D., Professors of Orthopedic Surgery, Jefferson Medical College, Thomas Jefferson University. They state: “No operation in any field of surgery leaves in its wake more human wreckage than surgery on the lumbar discs. The situation becomes even more pathetic in the realization that at the start, in most instances, is a healthy, self-sufficient individual. Many of these patients are subjected to numerous operations, and after each operation the patient is worse.”<sup>8</sup>

Before launching directly into proven non-invasive correcting procedures, we will first look briefly at a study on lumbar multifidus muscle changes and the role these muscles take in the processes of spinal displacement, rehabilitation, and correction.

A study of the correlation between magnetic resonance imaging (MRI) changes in the lumbar multifidus muscles and leg pain, reported in *The Journal of Clinical Radiology*,<sup>13</sup> was conducted to investigate the relationships between lumbar multifidus (MF) muscle atrophy and low back pain (LBP), leg pain, and intervertebral disc degeneration. In the assessment of the lumbar spine by MRI, changes in the paraspinal muscles are frequently overlooked.

A retrospective study of 78 patients, aged 17–72, presenting with LBP with or without associated leg pain was undertaken. The MRI images were visually analyzed for signs of lumbar MF muscle atrophy, disc degeneration, and nerve root compression. The clinical history in each case was obtained from case notes and pain-drawing charts.

The results of the study showed that MF muscle atrophy was present in 80% of the patients with LBP. This correlation between MF muscle atrophy and leg pain was found to be significant. However, the relationships between MF muscle atrophy and radiculopathy symptoms, nerve root compression, herniated nucleus pulposus, and number of degenerated discs were statistically not significant.

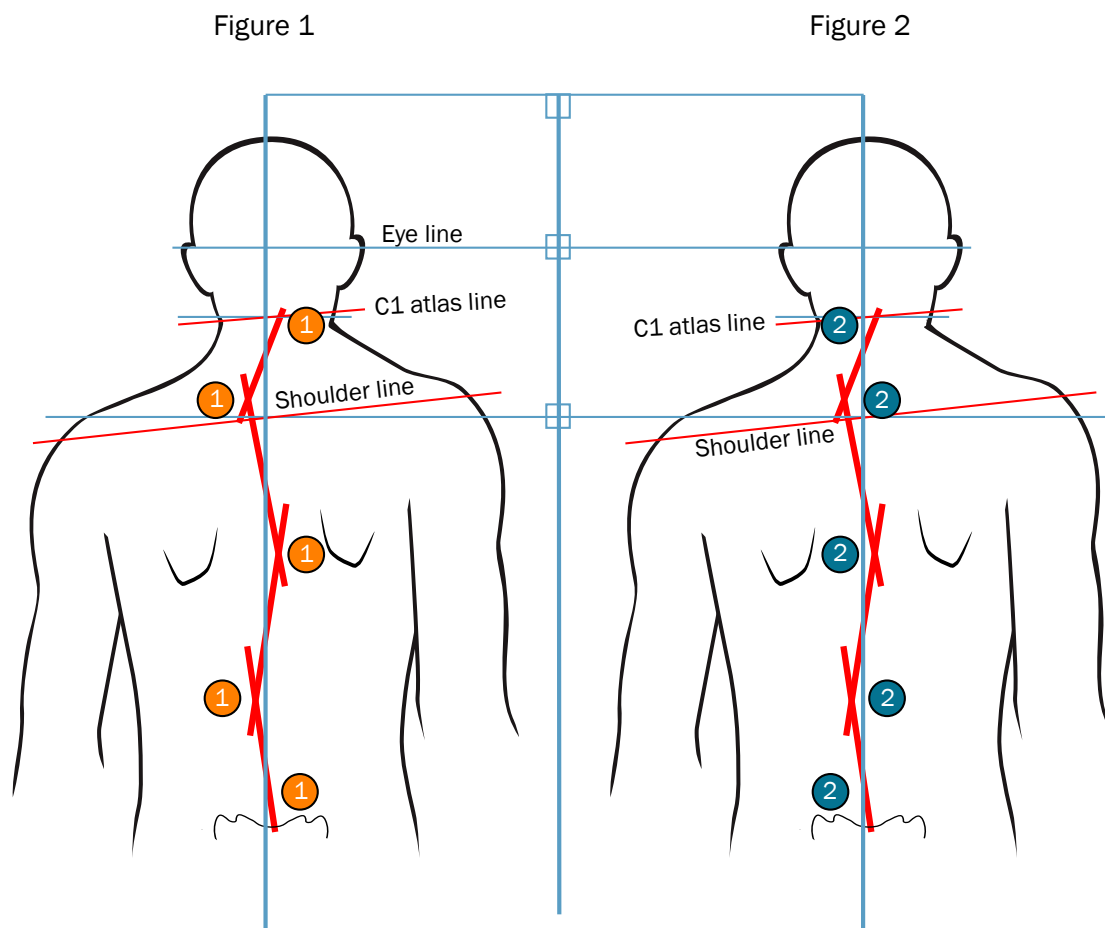
The study concluded that, when looking for atrophy of MF muscle when assessing MRI images of the lumbar spine, the examination of paraspinal muscles should be considered. This may explain the referred leg pain in the absence of other MRI abnormalities.

Remember, the global spine and spinal unit, rather than segmental displacements, are the real spinal displacement complexes. They cause:

- Nerve root compression.<sup>12</sup>
- Hypomobility, especially of the lumbar spine, with eventual hard- and soft-tissue pathology.<sup>12</sup> This leads palpation examiners to believe segments are fixated.
- Change of fast-twitch phasic muscle fibers to slow-twitch, especially of the multifidus muscle on the convex side of the subluxation configuration<sup>12</sup> (See Figure 1).
- Atrophy of muscles, especially the multifidus on the concave side of the spinal subluxation configurations<sup>13</sup> (See Figure 2).
- Normal spinal motion is coupled; that is, lateral flexion and rotation occur as one motion. The multifidus muscle is both a powerful flexor and rotator of the spine.

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Figures 1 and 2



Muscle changes from:

- ① Fast-twitch to slow-twitch at these angles
- ② Muscles atrophy at these points

**Muscles change from fast-twitch to slow-twitch fibers.**

**Muscles atrophy, especially the multifidus muscles.**

In reviewing this research, one must conclude that these described and documented muscle changes must be arrested and reversed before it is reasonable to expect either temporary or permanent spinal corrections to be made. If one's clinical procedures do not include muscle rehabilitation, then spinal correction cannot be achieved and any so-called 'adjusting' procedures are only modalities for symptoms, no different than diathermy or ultrasound.

The following questions must be asked and answered by the clinicians who are serious about correcting spine and posture abnormalities:

- Do you have a proven white-tissue (ligament and disc) rehabilitation exercise procedure that makes the correction of the spinal displacement processes possible?
- Do you have proven red-tissue (muscle) rehabilitation procedures which cause the slow-

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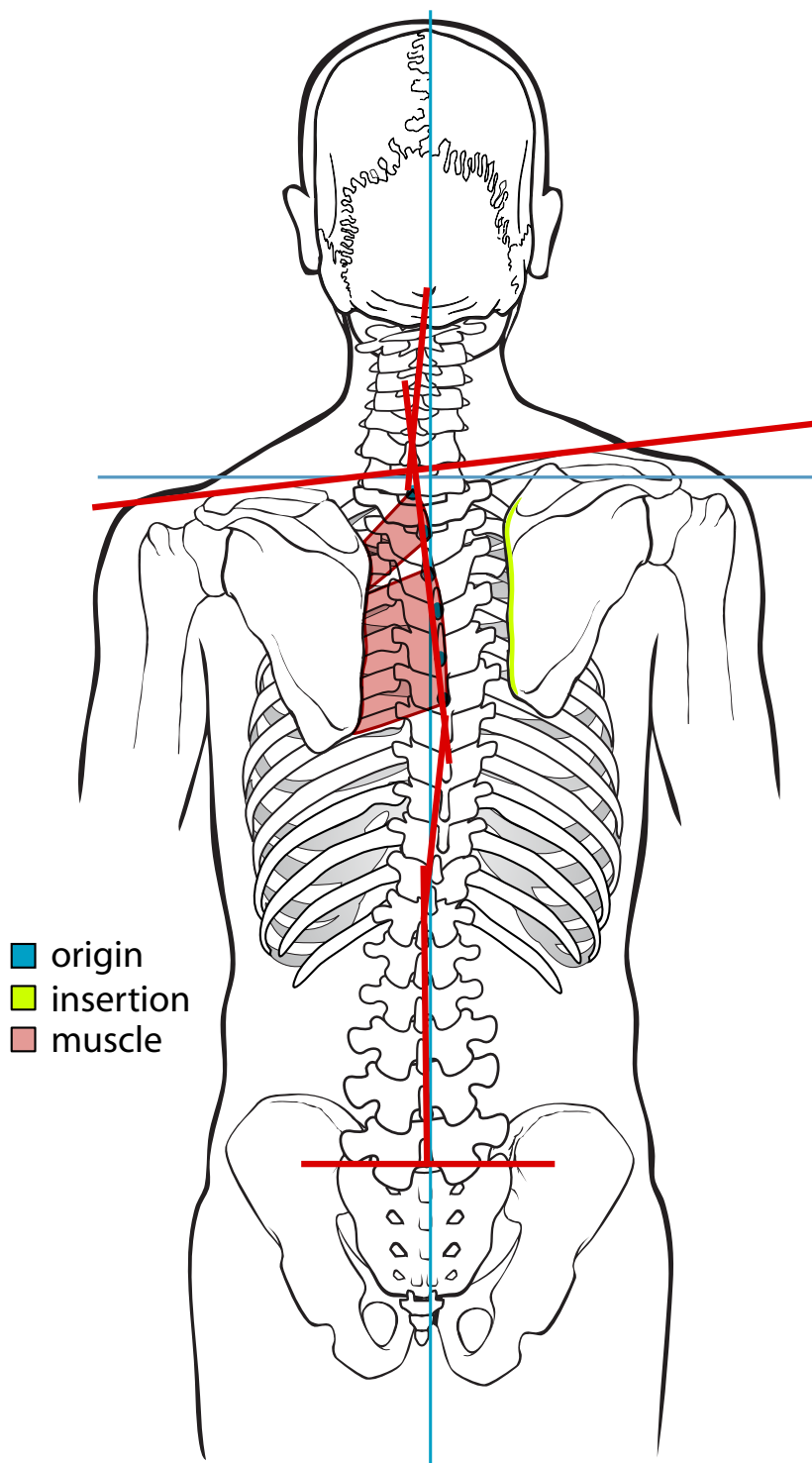
twitch muscle fibers to change back to fast-twitch while strengthening and rehabilitating the atrophied spinal muscles (especially the multifidus muscles)?

- If you do not have proven rehabilitation exercise procedures, then how do your present clinical procedures rehabilitate the ligaments, discs, and muscles involved in the spinal displacement complexes?
- Is your present clinical procedure designed to measurably correct spinal hard-tissue (bone) displacement complexes with proven correction that is visible on post-treatment x-rays?
- Is your present clinical mobilization procedure only therapeutic (solely for symptomatic relief) and not a part of permanent spinal correction?

It is important to know the physiology of the red and white tissues involved in the displacement and rehabilitation of the spine and how they affect the corresponding hard tissues. Therefore, keep the following red- and white-tissue attachments and actions in mind when formulating a rehabilitation plan:

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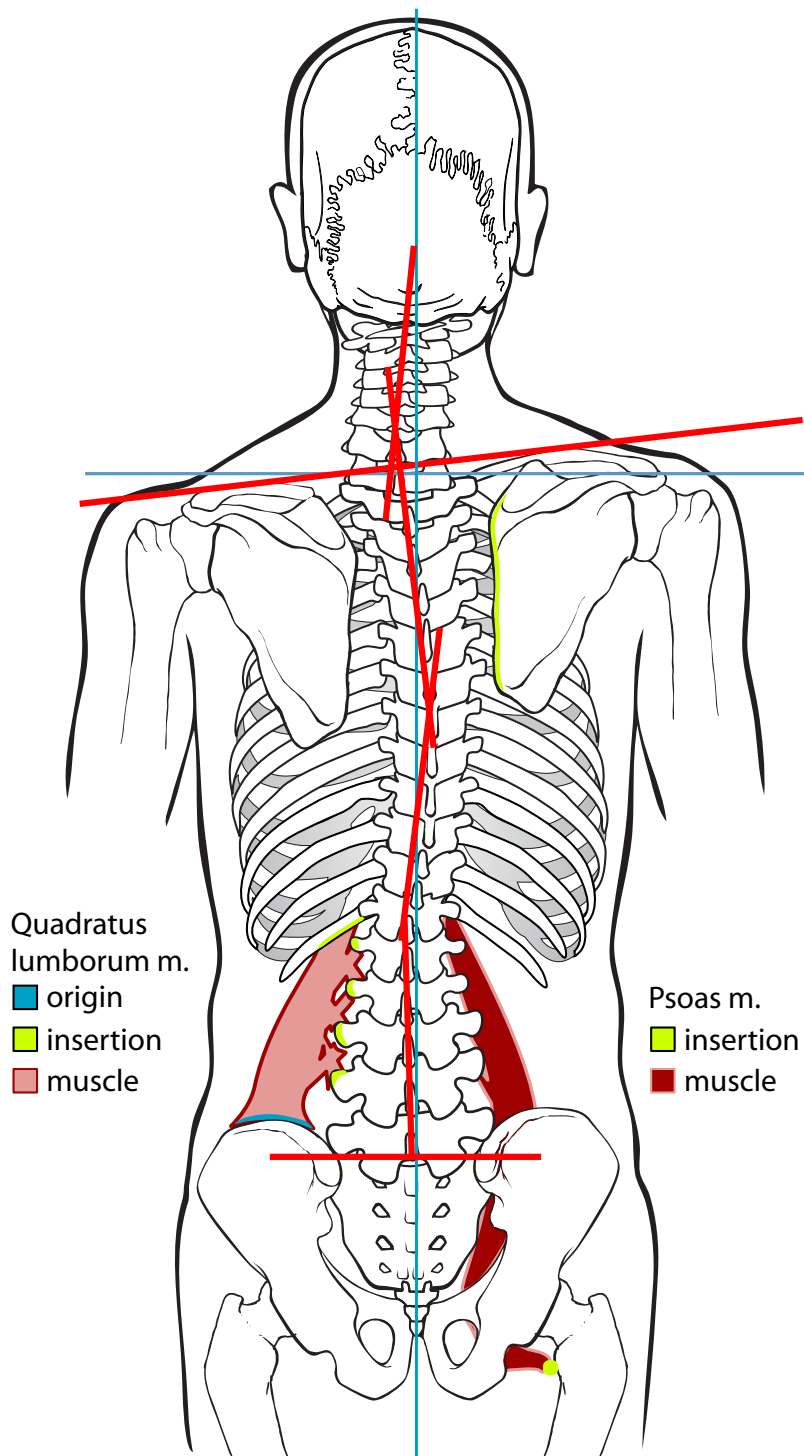
Figure 3



**Rhomboid muscle:** Attaches the scapulae to the thoracic vertebrae. Isometric contractions may be used to correct thoracic spine displacement by pulling the thoracic spine to the scapulae when the scapulae is immobilized.

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Figure 4

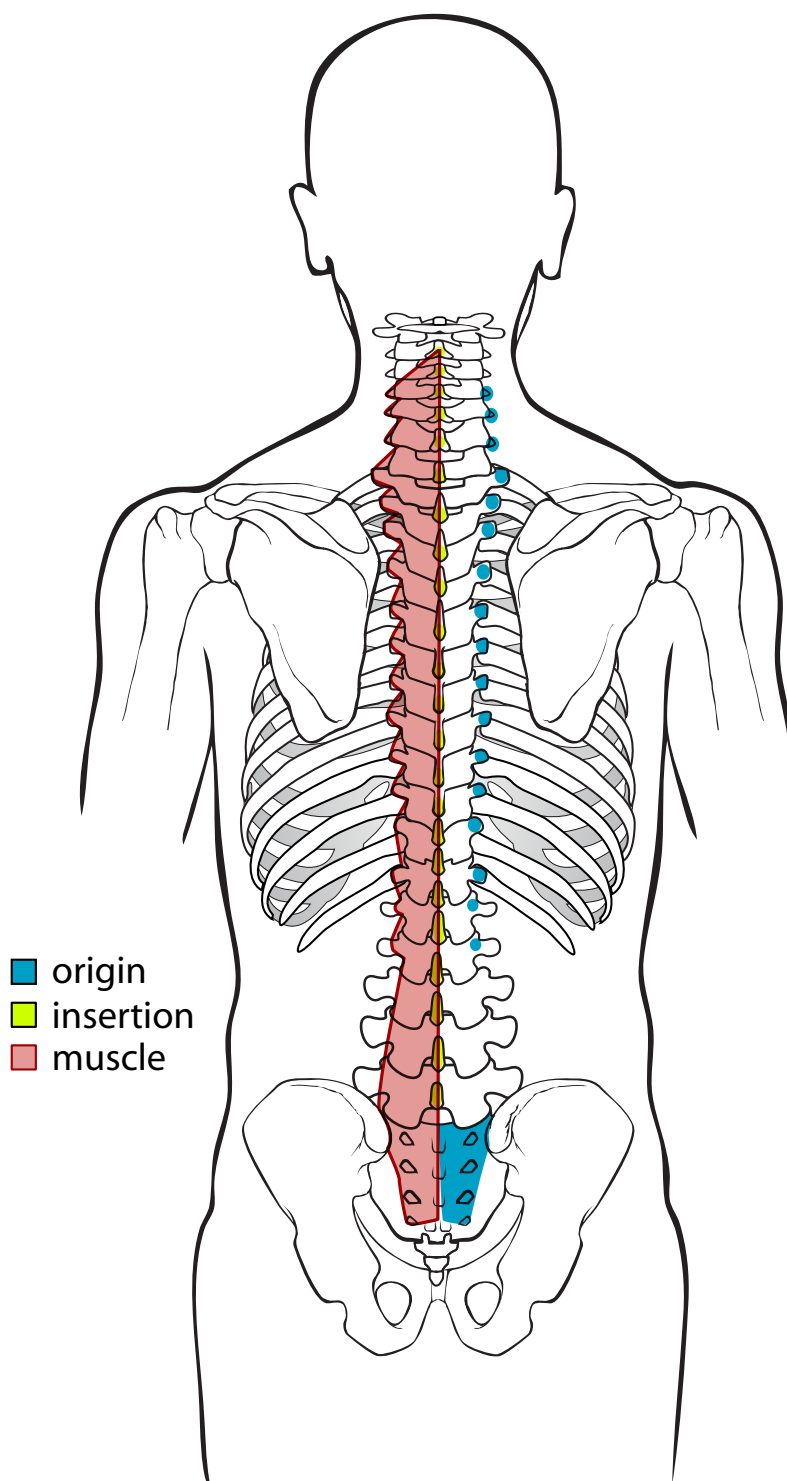


**Quadratus lumborum muscle:** Normally rotates and laterally flexes the thoracic spine toward the ilium. When this muscle is contracted on the obtuse angle side it may be used to correct spinal displacement

**Psoas muscle:** When contracted, causes lateral rotation of the lumbar spine toward the immobilized femur's head.

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Figure 5



**Multifidus muscle origin:** The back of the sacrum, mammillary processes of the lumbar, transverse processes of the thoracics, and articular processes of the lower four cervicals. **Insertion:** Spinous process above vertebra of origin.



# Spinal Disc Rehabilitation Procedures & Whole-Body Vibration

When spinal soft tissues are injured, the surrounding muscles spasm and splint, restricting motion. The normal disc's nucleus content is 88% fluid, and maintenance of that fluid level is dependent upon motion. Depleted fluid results in a loss of the disc's vertical height, weight-bearing ability, and function. Lumbar discs bear 75% of the body's trunk weight. When a disc loses its hydration and height, the weight it normally bears is shifted to the posterior spinal joints. These joints are not able to function under the additional loads. If the affected discs' and joints' cartilages are not remobilized, rehydrated, and rehabilitated, they lose function and develop various pathologies.

## Hydration

### The First Line of Defense

There are several elements, especially water and minerals, that must be present in the patient's body before any form of therapy can be effective.

Water is the most important element in the body. The human body is composed of over 75% water, and the nervous system is over 90% water.<sup>1</sup> Water is involved in the efficiency of all body functions. An adequate supply is needed for oxygen/carbon dioxide exchange in the lungs; food assimilation, utilization, and elimination; and the elimination of body toxins and wastes. Water is the transporter and solvent for the proper mixing of all the solids and chemicals that are needed for tissue-cell growth, repair, and functions. Water is especially needed for the function, repair, and growth of all avascular white tissues, including ligaments, cartilages, joints, and spinal discs.<sup>1</sup>

Not all water is the same. The pH of water determines its acid or alkaline state. A logarithmic scale from 1 to 14 is used to measure the pH of water, with 7pH being neutral. Below 7 is acidic, and above 7 is alkaline. A change from 7pH to 6pH is 10 times more acidic than 7pH, etc.<sup>21</sup> Blood normally is 7.3pH. The water one drinks should be slightly more alkaline than blood, that is, about 7.5pH. When the pH drops below 5.8, the body cannot absorb vitamins A, B, E, F, and K. In addition, minerals such as sulfur, potassium, calcium, chromium, zinc, iron, and vanadium cannot be absorbed from food or supplements.<sup>21</sup> This forces the body to absorb these minerals back from the bones in its attempt to continue functions that depend on their presence.

Patients often believe that distilled water, reverse-osmosis water, and all bottled water are good for them to drink. Most distilled and bottled water is acidic, less than 7.0pH. This is referred to as "dead water" because it is devoid of minerals, is extremely acidic, and tends to further dehydrate the user. Drinking alkaline water (7.1–7.5pH) helps regulate hydration needs by causing one to be thirsty, which automatically generates the drinking of more of the same. Drinking acidic water shuts down the nerves that cause the body's thirst for water.<sup>21</sup>

Most patients with musculoskeletal problems are already dehydrated. The lack of necessary vitamins and minerals is also often the cause of many conditions that may not respond to care, and the body cannot absorb those nutrients until an adequate amount of alkaline water is consumed each day by the patient. Neural functions and cerebrospinal fluid content, pressure, and flow are dependent upon water. When there is inadequate water in the body, neurotransmitters are shut down.<sup>21</sup>

Abundant research is available to all healthcare providers which concludes that most health problems, including cancer and diabetes, etc., begin in an acid environment.

An adequate supply of water is essential for the effective function of all nine of the body's systems. Further, the body has a water-rationing system in place all the time. When one doesn't drink enough water, the musculoskeletal system's water supply is depleted first. Water delivery to the spinal discs, ligaments, joints, cartilages, and muscles is rationed and/or eliminated so that the nervous and digestive systems have sufficient water to function. Should the water supply be further depleted so that there is insufficient water for digestion, one develops stomach and digestive problems in addition to musculoskeletal problems. Neither the "purple pill," nor any other pill, for that matter, will take the

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place of an adequate water supply; therefore, one should make sure his or her patients are drinking water with the proper pH before resorting to medication of any kind. (Often with the ingestion of adequate water amounts, gastro-intestinal symptoms will disappear.)

Water's pH can easily be regulated by the addition of a regulator that is available at animal supply stores to regulate fish tanks, or by the addition of calcium to the water. There are no side effects from these pH regulators.

## Loading and Unloading Cycle Exercises

At 12 to 14 years of age, the spinal discs' blood nutrition supply and waste elimination system atrophies. Then exercises that produce full-range motion are required to replace the spinal discs' hydration and nutrition-delivery system. The requirement for full range of spinal motion increases as an adult gains weight, strength, and endurance. The discs lift greater loads and perform at peak efficiency for longer durations of time. The spinal discs need a pumping system to pump in nutrition-rich fluid and pump out waste products.<sup>1</sup>

The intake of at least 64 ounces, or one-half an individual's body weight in ounces, of water each day is essential for spinal discs', ligaments', and joints' nutrition delivery and waste elimination, that is, if they are to perform at the optimal level. If one ingests coffee, tea, sodas, and alcohol, this necessitates doubling the water requirements.<sup>1</sup>

Nutrition delivery and waste elimination are produced by full-range motions that produce loading and unloading cycles. These actions pump nutrition-laden fluids into the spinal discs while at the same time pumping out waste with the fluids that are expelled.<sup>1</sup>

Each spinal disc nucleus normally contains 88% water.<sup>1</sup> The spinal discs in the upright spine lose approximately 3% of their water content daily due to the effects of gravity, which results in a loss of  $\frac{1}{2}$  to  $\frac{3}{4}$  of an inch in height. This loss of fluid is called creep. When the disc nucleus loses more than 3% of its water content, it begins to lose the ability to mix and remix the proteoglycan aggregate in the disc's nucleus with water after it is regained. Adequate water and remixing daily is necessary for a disc's nucleus to form a perfect gel. Spinal discs' gel that loses water becomes brittle and fractures if it is not replaced, as well as mixed and remixed with adequate water daily. A perfect gel in the disc nucleus is essential for symmetry and equal transfer of the weight from the vertebra above to the one below.<sup>1</sup>

If each spinal disc loses 10% of its water content, a person loses approximately two inches of height.<sup>1</sup> Seventy-five percent of a person's weight is normally supported by his or her lumbar spinal discs. Loss of disc height causes weight normally supported by the discs to be transferred to the posterior spinal joints. These joints are not able to support such high loads. The results are spinal disc and joint pathologies that may protrude into the intervertebral foramina and eventually the spinal canal. Vertebral bodies' nutrition delivery system is also altered; often, the vertebral bodies collapse with associated loss of function, chronic soreness, stiffness, and debilitating pain.<sup>1</sup>

It was originally thought that walking, running, and weight training would provide sufficient motion to pump fluids into and out of the discs. The use of video-fluoroscopy, as well as pre- and post-x-rays, have proven that this is not true. Research has shown that these exercises, by themselves, in fact, cause spinal-disc thinning, soreness, stiffness, and pain.<sup>1</sup>

Our research has proven that pumping fluids into and out of the spinal discs is possible as well as essential for pain elimination, spinal correction, and optimal function.<sup>20</sup> Furthermore, this research shows that cerebrospinal fluid pressure and flow is of utmost importance to brain and nervous system metabolism and function, as well as necessary for a feeling of physical and mental well-being.

The Pettibon Institute invented and tested a pivoting exercise device called the Pettibon Wobble Chair™. Using video-fluoroscopy, as well as pre- and post-Wobble Chair x-rays, it was found that, when properly used, this chair pumps and rehydrates the lumbar spinal discs just as the properly used

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Pettibon Repetitive Cervical Traction™ rehydrates the cervical discs.

Ligaments, discs, cartilage, and tendons have holding energy when not in motion. Loading and unloading cycles, through compression and traction, cause the temporary loss of this energy. This is called hysteresis. Hysteresis changes the nucleus pulposus of the discs from hydro-gel, a Jell-O™-like substance with resistance to positional change, into hydro-sol, a water-like solution with limited resistance to positional change. When the soft tissue's resistance is significantly reduced, then the joints and spine can easily be repositioned, especially during the first 6 minutes of inactivity following purposeful motions. During the next 14 minutes, holding energy is regained. Also, the nucleus reforms into a perfect gel, that is, if the spine is held in alignment.

Spinal motion, traction, and the process of rehydration may be enhanced through the use of vibration therapy during active rehabilitation.

## Whole-Body Vibration

### History of Vibration Therapy in Rehabilitation

Vibration therapy is not new. In a patent search, one can easily identify multiple patents going back many years. Dr. J. H. Kellogg was one of the first in the modern era (1800–1900) to utilize mechanical vibration as a modality to treat health problems, although the ancient Greeks used primitive methods to cause whole-body vibration (WBV). In 1960 Dr. Jan Biermann in Germany developed the forerunner of today's vibration methods. Later, the Russians utilized WBV to help their cosmonauts combat the effects of minimum gravity. In the 1970s, '80s, and '90s, the Soviet Union and the Dutch Olympic team trainers were the first to recognize the benefits of WBV to enhance athletic performances.<sup>29</sup>

There are several different models and methods for mechanical and electrical production of WBV in use at this time. We will be discussing mechanical whole-body vibration because electrical methods are not always painless and/or tolerated by patients.

Presently, there are two methods of mechanical WBV in use; they are piston (straight up-and-down motions) and the triangle-oscillating method. Essentially the triangle force is a wobbling force and may be more easily tolerated by patients. The Pettibon Vibrating Platform™, Wobble Chair, and Disc-Ease Decompression Traction Table™ utilize the oscillating-wobble method. At the present time, there is no published research proving one method superior to the other.

### Language and Physics

Whole-body vibration is a direct stimulation to the patient's muscles and nervous system, especially the cerebellum, the autonomic nervous system, and its reflexes. Over-stimulation, (use over too long of a time) may result in sweating and fatigue, and, in rare instances, the patient loses consciousness. Because WBV is such a powerful tool, it is critical that those using it in their offices understand the terminology associated with its use and how to identify when over-utilization is approaching.

**Frequency** is the number of vibrations per second. Most platform vibrations are controlled and may vary from 10 up to 60 Hertz (Hz). To be effective, the Hz is varied to fit the patient's body type and changed as the patient's physical condition changes.

**Amplitude** is the distance the vibration forces the platform to travel, usually from 1 to 4mm.

**Time** is the duration a person is exposed to vibration and varies from individual to individual, dependent upon the Hz used and muscle activity of the individual during exposure to the vibration.

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## Physiology

Whole-body vibration and/or vibration of any kind affects postural muscles rather than phasic muscles. Phasic muscles do not spasm or have tone.<sup>20</sup> The vibrations stimulate afferent fibers in the muscle spindles, causing reflex contractions, especially in loaded and/or stretched muscles. This increases muscle tone and eventually one's strength when performed on a regular schedule. Electromyography (EMG) activity is greatly increased with vibration of loaded or stretched muscles over voluntarily contracted muscles, causing them to fatigue up to 50% faster. Further, motor units of vibration-exercised muscles are more synchronized, resulting in greater control of balance and dexterity. Balance and dexterity may also be a product of vibration-induced somatosensory, central motor, and hypothalamus stimulation.<sup>21</sup>

WBV has also been shown to cause spastic and splinted muscles to relax, and prevents further spasms of muscles that have been over-stimulated.<sup>21</sup> A Pulse Ox instrument can indicate when vibration efficiency of stretched and/or loaded muscles has plateaued. Therefore, over-stimulation by time and/or amount can be monitored so that vibration and traction can be discontinued in the fatigued patient as soon as the plateau is reached.

## Associated Neural Increases

Neural drive is greatly enhanced by WBV and has been shown to increase blood flow as well as affecting the production of various hormones, motor-unit recruitment, and micro-traumas that are involved and necessary for muscle rehabilitation.

Research has shown that the prescription of correct vibration (Hz) and time in concert with various weighted maneuvers during rehabilitation training increases the following:<sup>29</sup>

1. The essential human growth hormone IGF-1 by 361%
2. Testosterone by 7%
3. Blood flow by up to 100%
4. Leg strength by 15%
5. Bicep strength by 10%

Vibration resulted in a decrease of low back pain by 66% as well as a decrease in production of the fat-causing stress hormone, Cortisol, by 32%.<sup>29</sup>

## Contraindications and Impediments

As in all clinical applications, the use of WBV is patient-specific. There are a number of system components to the success of WBV. The following has been shown to adversely affect its success:

1. The patient is dehydrated and/or not completely rehydrated before vibration therapy.
2. The pH of the water consumed is acidic rather than alkaline.
3. The patient is vitamin- and/or mineral- (especially RealSalt™) deficient, causing an electrolyte imbalance.
4. The patient's muscles are not warmed up, and the joints and white tissues are not stretched before they are vibrated and/or tractioned.
5. The patient vibrates too long, resulting in muscles and/or nervous-system fatigue.
6. The amplitude of the vibration is too great.
7. The patient is vibrated without loading his or her muscles.

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8. Full-range stretching and motions to remix fluids with discs' nucleus material do not immediately follow whole-body vibration therapy.

Clinical researchers at The Pettibon Institute have concluded that dehydrated patients respond entirely differently to vibration therapy than patients whom we have forced to drink adequate amounts of water prior to vibration. Therefore, viable conclusions on whole-body vibration can only be determined if a patient is well hydrated with an adequate intake of RealSalt™ for electrolyte balance before receiving vibration therapy and testing.

## Disc-Ease Decompression Traction Table™

### Clinical Protocols

The Pettibon Institute has many clinicians testing the results of our protocols. The results have produced a system of clinical care that is yielding unprecedented results. Those results are attainable only when the system protocols are followed. When a patient is selected to receive whole-body vibration, he or she must agree to daily home exercise as well as follow our prescribed in-office regimen prior to and following the decompression table. The following system is used:

1. Repetitive Cervical Traction followed by Wobble Chair workout of the cervical and lumbar discs, which stretch and warm up the muscles and produce hysteresis and hydro-sol in the discs' nuclei.
2. The cervical-thoracic spine is stretched with the 6-Way Cervical-Dorsal Stretch™ strap followed by thoracic roller stretching, often with additional chest weights.
3. In-home use of the Fulcrum Exercise Program, warm-ups and Wobble Chair, Repetitive Cervical Traction, and the Pettibon Weighting System™. The patient will be monitored for compliance.

### Whole-Body Vibration Preparation

To set up the patient and to traction-rehydrate the cervical discs, the patient lies in the supine position with knees bent for comfort on a special Disc-Ease Decompression Traction Table.

1. A specially designed traction device is attached to the patient's head and neck.
2. A traction force that is about 30 degrees forward of the cervical spine and up to 60 pounds is gradually applied and maintained for up to 15 minutes.
3. For traction-rehydration of the lumbar discs, a harness is attached to the pelvis, and the patient is positioned supine on the Disc-Ease Decompression Traction Table with knees bent and legs up for comfort.
4. A straight traction force of up to 50% of the patient's weight is gradually applied and maintained for up to 15 minutes.

### Vibration Protocols

Once the cervical and/or lumbar traction commences, the clinician dials the pre-determined starting Hz to initiate whole-body vibration. The vibration produced in conjunction with this table traction fatigues muscles up to 50% faster than just traction alone so that the traction is rapidly pulling fluids into the discs. Vibration also causes spasmed muscles to relax and prevents further muscle spasms.<sup>29</sup>

Until the addition of whole-body vibration to the decompression table, up to one-half of the table time was used just to cause the relaxation of postural muscles so that the traction could be effective. With the use of WBV, the patient receives a more thorough and time-effective traction session with a much

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better result.

Once a lumbar decompression session is completed, the patient is instructed to work his or her spine through full range of motion on the Vibrating Wobble Chair™ for three to five minutes. The cervical-disc patient must use the Repetitive Cervical Traction immediately following decompression traction for two to three minutes.

Post-rehydration traction workouts are critical to the successful clinical outcome. The use of WBV procedures on the Vibrating Wobble Chair for lumbar patients and Repetitive Cervical Traction for cervical patients re-establish hysteresis. This causes a remixing of the disc's proteoglycan aggregate in the nucleus with the newly acquired fluids so that the nucleus can then reform into a new, more perfect gel, that is, if the spine is held in alignment during the reforming of the perfect gel.

## Post-Traction Spinal Alignment Procedures

Upon completion of either WBV Wobble Chair maneuvers and/or Repetitive Cervical Traction, the patient is fitted with his or her own head, shoulder, and hip weights. The weight amount and placement have previously been determined by the patient's radiographs and postural examination. These weights will be worn for up to 20 minutes. They are time-dependent and cause the patient's nervous system and righting reflexes to force the spinal muscles to hold the upright spine aligned with proper lordotic curves relative to gravity during the reformation of the perfect gel.

The additional benefits of the weights affecting the nervous system and righting reflexes are as follows:

1. Discs and ligaments lose their holding energy (hysteresis) while being warmed up and reworked post-decompression traction and now regain holding energy while being held aligned. During this time—20 minutes—the nucleus of the disc changes from a hydro-sol back into the more perfect hydro-gel so that it can maintain alignment and dissipate equal forces from the vertebra above to the vertebra below during the activities of daily living.
2. Each rehydrating traction treatment and weighting session increases the discs' and spine's ability to heal in alignment, be normalized, and take their places in producing normal spinal form and function.<sup>20</sup>

## Essential Minerals

The following minerals are essential for musculoskeletal restoration and function as well as pain reduction and elimination:

### MSM

Reduction and elimination of pain should be an important first step in patient care, spinal rehabilitation, and correction. MSM is a nutritional supplement that supplies biologically active sulfur, an essential mineral nutrient for all body functions but especially for musculoskeletal conditions.

In the book, *The Miracle of MSM: The Natural Solution For Pain*,<sup>11</sup> the authors explain:

1. MSM helps relieve the following pain problems: Arthritis (osteoarthritis), back pain, headaches, fibromyalgia, muscle pain and athletic injuries, tendonitis, carpal tunnel syndrome, temporomandibular joint syndrome, dental pain, heartburn, and hyperacidity.
2. MSM helps relieve the following allergies: Pollen, asthma, sinusitis, and food allergies.
3. MSM helps relieve other pain problems: Rheumatoid arthritis, lupus, interstitial cystitis, and sclerodema.



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4. The Pain and Side-Effect Epidemic: In the past, treatments of pain typically revolve around pharmaceutical drugs and have contributed to sales that have made the pharmaceutical industry the nation's most profitable industry. Medical authorities caution physicians in regards to the use of nonsteroidal anti-inflammatories (NSAIDs) for pain. NSAIDs frequently cause ulcers, serious side effects, and even death. In addition, they often lead to many more health problems than they help. Unhealthy weight gain, high blood pressure, changes in facial features, and diabetes are just a few of the pages and pages of side effects of NSAIDs. MSM has no side effects and is no more toxic than pure water.
5. MSM is often so effective for pain relief that doctors are able to lower or even discontinue the patient's pain medication.
6. All new patients should be prescribed MSM with adequate water intake. The amount of MSM varies with each person: 6 to 20 or more grams per day is often needed at the beginning of care. When the patient is taking too much MSM, they will have a slightly upset stomach and will salivate excessively. If this happens, reduce the dosage.

## RealSalt™

For proper function and electrolyte balance, the body requires an adequate amount of RealSalt. Patients who are salt-deprived complain of unexplained aches, especially headaches. There is an onset of muscle cramping, especially of the large ones, which usually occurs in the legs and particularly at night. This cramping indicates the need for digestible salt. Ordinary table salt has been cooked and contains added preservatives. It does not have the 84 trace minerals that are needed for digestion and other bodily functions. It is, therefore, not good for human consumption and may cause arterial diseases, high blood pressure, and other complications. Natural salt is uncooked and has no preservatives and is essential for electrolyte production, which is necessary for neural activity and function. The cooking of salt and addition of preservatives changes its composition, taste, and metabolic functions.

We recommend that patients be informed of the possible negative effects of using regular table salt and told to use only the natural mineral salt that contains 84 trace minerals. It is called RealSalt or goes by other trade names. RealSalt contains the 84 minerals that are essential to the human body.<sup>20</sup>

To insure proper amount of water and salt consumption, we recommend that patients be instructed to drink one or more ounces of water saturated with RealSalt each morning, followed by 16 ounces of pure water.

When a person overdoses on salt, his or her feet begin to swell and cravings disappear. To correct foot swelling, simply reduce the amount of daily salt intake until the feet no longer swell.

## Calcium

Calcium is needed for the structure and functions of most body tissues.<sup>1</sup> When the patient is calcium-deprived, several different tissues react. Often, the first reaction is inflammation and bleeding. The gums bleed, with resulting bad breath and periodontal disease, and muscles go into tetany with cramps, spasms, and splinting. Spasms usually start with the large muscles of the legs, especially after the patient has been working and perspiring and then attempts to relax. Patients needing calcium usually don't sleep well or soundly.

Humans can only utilize calcium in the presence of water-soluble vitamin D.<sup>1</sup> The Pettibon Institute has found that 30 to 90mg per day of 100% pure sea "Coral Calcium" satisfies the needs of most patients who are calcium-deprived. We have found that the best time to take the calcium and vitamin D is just before bed. The best source of vitamin D is cold-water fish oils such as cod liver oil.<sup>20</sup>

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## Magnesium

Magnesium prevents the calcification of soft tissues. It protects the arterial linings from stress caused by sudden blood pressure changes. Magnesium is a vital catalyst in enzyme activity, especially the activity of those enzymes involved in energy production. A deficiency of magnesium interferes with the transmission of nerves and muscle impulses, causing irritability, nervousness, depression, dizziness, muscle weakness, twitching, and premenstrual syndrome (PMS). Magnesium aids in maintaining the body's proper pH balance and normal body temperature.<sup>1</sup> NOTE: Calcium and magnesium should be taken at a 5:3 calcium-to-magnesium ratio, that is, taken daily but not necessarily at the same time.

## Glucosamine Sulfate and Glucosamine Hydrochloride

Glucosamine sulfate and glucosamine hydrochloride have proven to play an important role in good joint health with the ability to build joint cartilage in over 300 studies and 20 clinical trials.<sup>1</sup> Glucosamine hydrochloride is more effective in senior citizens and weekend athletes. NOTE: Glucosamine has been shown to increase LDL cholesterol levels in some individuals.<sup>1</sup>

## Chondroitin Sulfate

Chondroitin sulfate is an important element in the creation of cartilages and the tough yet flexible connective tissues which act as cushions in joints. Chondroitin sulfate attracts water to the proteoglycans of joints and discs and holds it there.<sup>1</sup>

## Potassium

Potassium is a mineral that is important for a healthy nervous system and a regular heart rhythm. It helps prevent stroke, aids in proper muscle contraction, and works with sodium to control the body's water balance, stabilize blood pressure, and transmit electrochemical impulses.<sup>1</sup>

## Growth Hormone Support

Growth hormone support contains the amino acids agrinine and ornithine. These amino acids support healthy growth hormone production. Growth hormone is naturally released by the pituitary gland in response to sleep and exercise in order to help replenish tissues. It supports muscle protein synthesis, moderates the breakdown of muscle tissues, and promotes fat utilization for energy.<sup>1</sup>



## Spinal Disc Rehabilitation Procedures & Whole-Body Vibration

Nutritional Deficiency and Its Symptoms		
Nutrient	Incidence of Deficiency	Typical Symptoms and Diseases
Biotin	Uncommon	Dermatitis, eye inflammation, hair loss, loss of muscle control, insomnia, muscle weakness
Calcium	Average diet contains 40 to 50% of RDA*	Brittle nails, cramps, delusions, depression, insomnia, irritability, osteoporosis, palpitations, periodontal disease, rickets, tooth decay
Chromium	90% of diets deficient	Anxiety, fatigue, glucose intolerance, adult-onset diabetes
Copper	75% of diets deficient; average diet contains 50% of RDA*	Anemia, arterial damage, depression, diarrhea, fatigue, fragile bones, hair loss, hyperthyroidism, weakness
Essential fatty acids	Very common	Diarrhea, dry skin and hair, hair loss, immune impairment, infertility, poor wound healing, premenstrual syndrome, acne, eczema, gall stones, liver degeneration
Folic acid	Average diet contains 60% of RDA*; deficient in 100% of elderly in one study; deficient in 48% of adolescent girls; requirement doubles in pregnancy	Anemia, apathy, diarrhea, fatigue, headaches, insomnia, loss of appetite, neural tube defects in fetus, paranoia, shortness of breath, weakness
Iodine	Uncommon since the supplementation of salt with iodine	Cretinism, fatigue, hypothyroidism, weight gain
Iron	Most common mineral deficiency	Anemia, brittle nails, confusion, constipation, depression, dizziness, fatigue, headaches, inflamed tongue, mouth lesions
Magnesium	75 to 85% of diets deficient: average diet contains 50 to 60% of RDA*	Anxiety, confusion, heart attack, hyperactivity, insomnia, nervousness, muscular irritability, restlessness, weakness
Manganese	Unknown, may be common in women	Atherosclerosis, dizziness, elevated cholesterol, glucose intolerance, hearing loss, loss of muscle control, ringing in ears
Niacin	Commonly deficient in elderly	Bad breath, canker sores, confusion, depression, dermatitis, diarrhea, emotional instability, fatigue, irritability, loss of appetite, memory impairment, muscle weakness, nausea, skin eruptions and inflammation
Pantothenic acid (B5)	Average elderly diet contains 60% of RDA*	Abdominal pains, burning feet, depression, eczema, fatigue, hair loss, immune impairment, insomnia, irritability, low blood pressure, muscle spasms, nausea, poor coordination
Potassium	Commonly deficient in elderly	Acne, constipation, depression, edema, excessive water consumption, fatigue, glucose intolerance, high cholesterol levels, insomnia, mental impairment, muscle weakness, nervousness, poor reflexes

## Spinal Disc Rehabilitation Procedures & Whole-Body Vibration

Nutritional Deficiency and Its Symptoms		
Nutrient	Incidence of Deficiency	Typical Symptoms and Diseases
Pyridoxine (B6)	71% of male and 90% of female diets deficient	Acne, anemia, arthritis, eye inflammation, depression, dizziness, facial oiliness, fatigue, impaired wound healing, irritability, loss of appetite, loss of hair, mouth lesions, nausea
Riboflavin	Deficient in 30% of elderly Britons	Blurred vision, cataracts, depression, dermatitis, dizziness, hair loss, inflamed eyes, mouth lesions, nervousness, neurological symptoms (numbness, loss of sensation, "electric shock" sensations), seizures, sensitivity to light, sleepiness, weakness
Selenium	Average diet contains 50% of RDA*	Growth impairment, high cholesterol levels, increased incidence of cancer, pancreatic insufficiency (inability to secrete adequate amounts of digestive enzymes), immune impairment, liver impairment, male sterility
Thiamin	Commonly deficient in elderly	Confusion, constipation, digestive problems, irritability, loss of appetite, memory loss, nervousness, numbness of hands and feet, pain sensitivity, poor coordination, weakness
Vitamin A	20% of diets deficient	Acne, dry hair, fatigue, growth impairment, insomnia, hyperkeratosis (thickening and roughness of skin), immune impairment, night blindness, weight loss
Vitamin B-12	Serum levels low in 25% of hospital patients	Anemia, constipation, depression, dizziness, fatigue, intestinal disturbances, headaches, irritability, loss of vibration sensation, low stomach acid, mental disturbances, moodiness, mouth lesions, numbness, spinal cord degeneration
Vitamin C	20 to 50% of diets deficient	Bleeding gums, depression, easy bruising, impaired wound healing, irritability, joint pains, loose teeth, malaise, tiredness
Vitamin D	62% of elderly women's diets deficient	Burning sensation in mouth, diarrhea, insomnia, myopia, nervousness, osteomalacia, osteoporosis, rickets, scalp sweating
Vitamin E	23% of male and 15% of female diets deficient	Gait disturbances, poor reflexes, loss of position sense, loss of vibration sense, shortened red blood cell life
Vitamin K	Deficiency in pregnant women and newborns common	Bleeding disorders
Zinc	68% of diets deficient	Acne, amnesia, apathy, brittle nails, delayed sexual maturity, depression, diarrhea, eczema, fatigue, growth impairment, hair loss, high cholesterol levels, immune impairment, impotence, irritability, lethargy, loss of appetite, loss of sense of taste, low stomach acid, male infertility, memory impairment, night blindness, paranoia, white spots on nails, wound healing impairment

## Spinal Disc Rehabilitation Procedures & Whole-Body Vibration

The Suggested Optimal Daily Nutritional Allowances (SONA)				
Vitamins	Men		Women	
	RDA	SONA	RDA	SONA
Vitamin A (RE, 1RE = 1 micro gm - 3.33 IU)	1,000	2,000	800	2,000
Beta-carotene (mg)	N/A	100	N/A	810
Vitamin D (micro gm, 1 microgram = 40 IU)	5	24	5	24
Vitamin E (IU, 1 IU alpha tocopherol equivalent to 1 mg alpha tocopherol)	10	800	8	800
Vitamin K (mg)	80	80	65	65
Vitamin C (mg)	60	800	60	1,000
Vitamin B12 (mg)	2	3	2	3
Folic acid (micro gm)	200	2,000	180	2,000
Niacin (mg)	15	30	15	25
Pyridoxine (B6) (mg)	2	25	1.6	20
Riboflavin (B2) (mg)	1.4	2.5	1.2	2
Thiamin (B1) (mg)	1.2	9.2	1	9
Minerals				
Boron (mg)	N/A	2.5	N/A	3
Calcium (mg)	800	700	800	1,200
Chromium (micro gm)	50-200	300	50-200	300
Copper (mg)	1.5-3	1.5-4	1.5-3	1.5-4
Iodine (micro gm)	150	150	150	150
Iron (mg)	10	20	15	20
Magnesium (mg)	350	600	280	550
Manganese (mg)	2-5	10	2-5	10
Phosphorous (mg)	800	800	800	800
Potassium (mg)	99	200-500	99	200-500
Selenium (micro gm)	70	250	55	200
Sodium (mg)	500	400	500	400
Zinc (mg)	15	20	12	17

## Conclusions

1. Most lumbar disc surgeries cause more problems than they correct.
2. Proven noninvasive spinal-correcting procedures should be used, with spinal disc surgery as a last resort.
3. Pre- and post-spinal rehabilitation procedures are necessary for spinal discs' permanent correction of form and function.
4. Establishing proper water, vitamin, and mineral content in the patient is the important first step in spinal form and function correction.
5. Establishing and training the patient in home-care rehabilitation procedures that they are expected to continue are an essential part of patients' activities of daily living that can be expected to maintain a healthy musculoskeletal system.

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