

## Planet Earth and the Gravity of the Situation

The human spine was never optimal in its design for biped ambulation on a high gravity planet such as earth. Its structure clearly indicates that it was more favorably suited for use by a four-legged creature. It was probably about 3 million years ago that one of our ancestors decided to try walking on two legs. For those born with [genetically](#) "good equipment" biped ambulation has generally worked out well.

For those who have chosen their parents less carefully and thus have become endowed with less-than-optimal spine structure at birth the path down the road turned out to be a great deal more difficult, particularly if the individual's life-expectancy was greater than 50 years.

Unfortunately, for those who have come into the world with poor anthropomorphic spinal equipment the world (so far) has provided little in the way of understanding, sympathy, or reasonably effective assistance. Things, in this regard just haven't changed very much so far. The typical back sufferer still receives little in the way of common sense assistance and the early identification and prevention of spinal genomic disease are still words not well understood in the health care community despite the great amount of time and money expended in attempting to effectively treat back problems.

Given these unfortunate realities it has become essential for those afflicted with back disabilities to engage in self-education and begin to seek rational assistance on their own. The daily environmental and occupational compressional and rotational forces/stresses exerted on the spine through the normal daily activities of standing, sitting, walking, or riding in a motor vehicle are remarkably high and have been understood by only a [few professionals](#).

We know that many back problems are a job-related disease in occupations such as trucking where the acquired daily insult and injury are inordinately high. We also know that individuals who have good muscle strength, tone and flexibility and who exercise on a daily basis have relatively less in the way of back problems and associated disability.



Following Russian cosmonaut Yury Gagarin (April 12, 1961) and American astronaut Alan Shepard (May 5, 1961) space adventures their flight surgeons were surprised to note that a common problem among space explorers was low back pain acquired while they were weightless. Scientific studies relating to this concern initiated by the United States Space Agency and their Soviet counterparts documented that the elimination of the force of gravity was producing an over distention of their intervertebral discs.

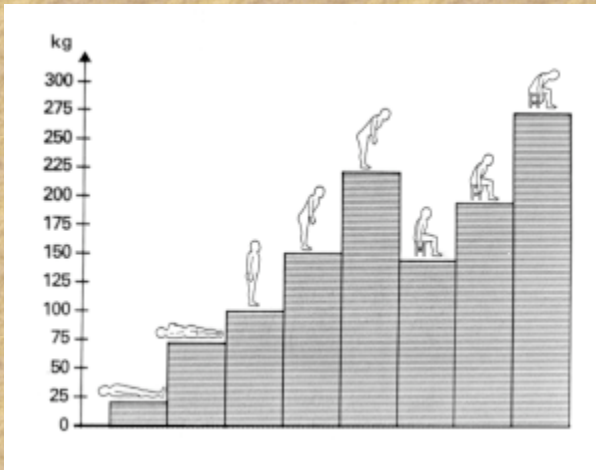
Due to ambient weightlessness many of the early space explorers increased their body height as much as 2½ inches during the first 72 hours of weightless flight

due to the increased disc volume. Height returned to normal within 24 hours following a safe landing on earth. After almost 50 years of space exploration this phenomenon still exists. Minnesota woman astronaut Heidemarie Stefanyshyn-Piper noted, upon returning from space aboard the shuttle Atlantis in September, 2006, that she had gained 1 inch in height during the mission.

Low back pain experienced by astronauts is caused by an increase in [diffusion of fluid](#) across the vertebral endplates because of the decrease in intradiscal pressure (much like the over-inflation of a balloon). In order to counteract this effect artificial gravitational environments and pressure suits were introduced and low back pain has not been a serious concern because of this.

The important lesson drawn from this experience was that if intradiscal pressure were to be decreased on earth it should then be possible to enhance disc nutrition. The key would be to carry this out in a controlled, regular, and safe fashion.

Few among us give much attention to the subject of spinal loading or the amount of stress and insult being directed to our spines on a daily basis. As it turns out discal loading varies considerably during a normal day depending on body position.



The illustration at left has been redrawn from the classic work of **Alf Nachemson** (Nachemson A: The Load on Lumbar Disks in Different Positions of the Body, Clin. Orthop., 45:107-122, 1966). It shows loading (in kilograms) recorded from intradiscal pressure transducers inserted into the L3 disc space of volunteers.

Not many realize that there is more loading in the sitting, rather than the standing position. Even when recumbent there remains some loading on the spine.



The great advantage of floating in water is that there is no associated body loading. For this reason swimming, and particularly aquatic aerobic exercise are spine friendly. A number of different devices including aquatic treadmills (to be placed in swimming pools) have been produced and self-contained aquatic exercise tanks have also been developed to assist aquatic aerobic exercise.

**Anti-Gravitational Spinal Unloading & Distraction**



## **The Logic of Intermittent Spine Unloading/ Distraction (Traction)**

Unloading simply means that the amount of loading is decreased. Traction (or distraction) relates to an influence beyond zero loading. This has been a difficult concept for most individuals to understand. The simile is that of the accordion player who does not simply continue to compress the instrument but compresses, and then expands. The human spine is compressed throughout the day by standing, sitting, or walking.

At night spine loading is minimal but still present. To intermittently expand (distract) the spine allows for better trans-endplate diffusion and convection of nutrients, reverses the degenerative process and also begins to reverse disc protrusion as well as providing a reversal of the process of lateral foraminal stenosis and progressive scoliosis. In fact spinal traction has been an important therapy in health care for thousands of years.

Intermittent spinal distraction, through exercise or devices, experienced on a regular and long-term basis is very important, not only for spinal health maintenance, but for spine disease prevention.

Once the adversities of poor parent selection (genomics) and the acquired insults of loading of the spine in daily life becomes better appreciated it then becomes possible to begin to explore more logical and scientifically established means of safely improving spine health. The key to good spine health maintenance is to decrease the daily insults to it as well as enhance spine nutrition and health by the induction of safe and intermittent negative

discal pressures designed to enhance nutrition and healing by reversing the effect of gravity. We know that when intervertebral discs degenerate they lose their normal strength and become subject to tears, from rotational stress, and herniation from compressional forces. By the regular introduction of safe anti-gravitational distractive influences it is possible for an individual to actively promote good disc health. The term "safe" refers to distractive forces not exceeding the compliance of normal disc or ligamentous tissue. The science of increasing the life expectancy of the disc normal beyond "normal" is part of the concept of "[eugonomics](#)."



This image shows clients at a health spa in Kiev, Russia being suspended from harnesses in natural warm springs. This spa has been actively treating clients in this manner for centuries. The treatment being provided is basically sound.

The problem with such insightful technologies is similar to the [Gaiffe TENS device](#) produced in Paris in the 1880s. While the basic concept is logical the designed application is inadequate to achieve intended results (as were many of the devices designed by Leonardo da Vinci). This support shown has only minimal effect on the discs themselves. From the standpoint of treating associated pain and spasm by applying "heat therapy" the activity benefits the patient by addressing the [symptoms of the problem](#) rather than the problem itself.



### **Aquatic Spine Unloading/ Distraction**

A more modern, and much more effective Kiev Spa therapy is shown at the left. Here the individual's body weight is being supported by an inflated inner tube and scuba diver weights are being worn around the waist to allow for spinal distraction. The method is inherently safe because the force exerted is self-limited and the compliance of normal tissue is never exceeded.

This activity can be performed in shallow water. For those with access to a warm pool the most optimal application would be 2-3x/ day, on a daily basis. Unloading/ distraction is most meaningfully utilized in the afternoon and evening when rotational and continued compressional forces have begun to exert their most deleterious effects. The [modern technology](#) of spine unloading/ distraction has come a long way since the Kiev spa but there is little knowledge of this in the community or in the health professions at this time. With the advent of genomic screening techniques public awareness will most certainly raise the awareness of the health care community in the future.