

How to Have a Healthy Back

By

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Doctor Mooney is currently the Medical Director of U. S. Spine and Sport in La Jolla, California. He has had over 30 years of experience in general Orthopaedics and spine care. From 1977 to 1988, Doctor Mooney was Chief of Orthopaedic Surgery at Parkland Hospital in Dallas. He was also Director of their Orthopaedic Training Program.

Doctor Mooney is a nationally recognized medical researcher who has conducted studies in many areas related to orthopaedics. He has written close to 200 journal articles and abstracts, over 30 chapters for medical texts, and in the last six years has been invited to speak at over 125 medical conferences throughout the world. In addition to spine surgery, Doctor Mooney is actively involved in Orthopaedic Rehabilitation using innovative, specialized equipment.

Doctor Mooney has been actively involved in and past president of many Orthopaedic, surgical and spine-related medical associations, including the Orthopaedic Chairman's Association. He is current Vice President of the American Orthopaedic Association and is the president-elect of the International Intradiscal Treatment Society. Doctor Mooney currently holds staff positions at UCSD Medical Center and UCSD Thornton Hospital. He is a Professor of Orthopaedic Surgery at the UCSD School of Medicine.

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INTRODUCTION

Low-back pain is the most common musculoskeletal disorder in the industrialized world. In fact, after heart disease and cancer, low-back pain follows as the most costly medical problem facing society today. While nobody dies of low-back pain, it should come as no surprise that the productive lives of hundreds of people are lost each day to spinal dysfunction; you too, unless you become knowledgeable about the subject, could be facing a life of back pain.

What may come as a surprise is that the overwhelming majority of spinal pain is entirely avoidable and, once contracted, absolutely correctable. Why then do people with back problems seem to have them forever? And why, in a day of unsurpassed technology, does this particular group of sufferers increase while those with most other medical issues shrink? The principle problem related to diagnoses and treatment of low-back pain is that the healthcare professionals who deal in back pain come from widely divergent medical backgrounds; their approaches to a particular back problem often have little if anything in common. These professionals range from physical therapists and chiropractors to spine surgeons and pain doctors. It is no shock then that treatment choices for a sufferer are radically different and confusing. So are the results.

While there is no unifying force or element in back-pain analysis and treatment, most in the business share two things: 1) Most non-surgical treatments focus on how to make you simply feel better, not necessarily get better. And the surgical approach, while it may relieve a terribly painful situation, fails post-operatively to restore the back to a fully functional state, a state which, had it been restored prior to surgery, may have avoided such a drastic and irreversible course in the first place. 2) The size of the 'back-pain pie' is huge; estimates as large as \$20 billion are probably conservative. Those who purchase back-pain treatment purchase just that, treatment. No one sells a cure. You can't buy one. But, you can buy an unlimited chain of 'treatments'. This explains why insurance companies, with the exception of worker's compensation insurance, aren't seeking a cure. Approximately 25% of their profits come directly from additional fees tacked onto premiums and dedicated to back pain treatments. Eliminate treatments, eliminate margins. Eliminate margins, reduce profits. It's no conspiracy. It's American healthcare economics; Yankee free enterprise superimposed on medicine. This is the economic reason. What's the medical reason?

What is lacking in all of this is identification of a core issue in back assessment. This discussion identifies that core issue, tells you how the core issue relates to you, how you came to suffer in the first place, how to really get better not just feel better, and how to avoid back-pain recurrences. Here I offer sufficient information to give you control over the destiny of your own health. Armed with this knowledge, you can at once regain an active, pain-free life.

BASIC ANATOMY

THE DISC

The most significant structure in your back is considered to be the intervertebral disc. And, since the disc heads the list of topics people talk about relating to the back, let's start here. The disc must be considered a joint in that it connects each bone segment of the spine—the vertebra—to the one next to it. This connection is very strong, but allows a small amount of motion between two vertebrae in multiple directions simultaneously. For example, when we bend down to touch our toes, we can also bend sideways, or twist our chest in relation to our pelvis, all at the same time. The intervertebral disc should be considered as a universal joint because it allows some bending and rotation in all ranges of motion. This type of joint is found nowhere else in the body other than in the spine.

Another function of the disc is that of a shock absorber. Because of the disc's shock-absorbent nature, our backs tolerate nicely sudden shock waves of force such as when we jump off the swing or run down stairs. In such activity, the disc acts like a shock absorber in a car as the car bounces over a speed bump; it spreads out the sharp peak of a sudden load, protecting the car's suspension and allowing it to return to the same posture it had before encountering the bump.

The final function of the disc is that of a spacer or filler maintaining a precise distance between vertebrae. For it is within this space between vertebrae that nerves energizing all parts of our body, except our head, enter and exit the spine. When this space is not adequately maintained, vertebrae compress one upon another, pinching these nerves in between. Back pain results coupled with possible malfunction of the body parts that those pinched nerves control.

DISC CONSTRUCTION

In its construction, the disc has a soft, shock absorbent center known as the nucleus and a stronger, stiffer outer binding known as the annulus. Neither of these tissues have direct blood supply and thus, all cells living inside the disc must gain nutrition by some other means. That other means is by diffusion of water. This water comes from the bloodstream, contains all the necessary salts, sugars, and proteins to nourish disc cells, and surrounds the disc at all times. Productive disc cells make the strong connective fibers (collagen) for the binding portion of the disc and the cushy substance that gives resilience to the central portion (proteoglycons). Because the disc is truly living tissue, besides maintaining resilient and binding qualities, existing disc cells must constantly generate new cells to replace exhausted and worn out old ones.

The water dispersing mechanism by which discs supply themselves with elements needed for normal maintenance and repair is somewhat peculiar. A clear knowledge of this process is key to understanding how to cure low-back pain.

DISC HYDRATION

In the disc there are fewer cells compared to a similar amount of tissue anywhere else in the body, and it is very easy for these relatively few cells to be cut off from essential nutrients. The disc functions much like a sponge that soaks up water as it

expands which can then be squeezed out by making the sponge smaller. In similar fashion, nutrition for each disc cell can only be achieved by the disc swelling up with water—water loaded with rich nutrients from the bloodstream. When this moisture is later squeezed out, it carries with it waste products and break-down products. The amount of change in size for a disc is much less than for the typical household sponge, but it really happens. This is evidenced by the fact that we all grow slightly taller during the night as we lay sleeping. The force of gravity is diminished within our spine and the discs can swell. Thus we see that physical activity provides the pumping action for the exchange of fluid within the disc. In the vascular system, of course, the heart does this, but within the disc, there has to be movements of compression and expansion. Compression and expansion activate the hydration cycle.

MECHANICAL COMPONENTS OF DISC FAILURE

DISC DEGENERATION

When the compression aspect of the hydration cycle is not balanced by the expansion aspect—too much sitting and inactivity and not enough appropriate exercise—a weak spot may develop in the outer ring of the disc. In that weak spot, a portion of the disc may protrude out into the spinal canal where the nerves are. I have somewhat over-simplified here because there are other degenerative situations resulting from inactivity that add to the problem. But, restricting this portion of the discussion to the disc, let me say that the portion of degenerative problems solved by exact exercise is great. In fact, the very process of disc and spinal degeneration in general have no other remedy than to reactivate the spine through a series of special exercises.

Returning to the earlier discussion, when disc material abnormally compresses between the vertebrae, the vertebrae come closer together. Nerves, then, become pinched between either the vertebrae or between the bulging disc and the nerve canal within vertebra. Pain begins as soon as the nerve is contacted and will continue until the nerve is relieved. The only way to relieve the nerve is to restore the free space it once enjoyed. This space can be re-established therapeutically or new space can be created surgically by cutting away part of the disc or shaving bone from the vertebra, or all of the above. Certainly, disc therapy is the method of choice. Sadly, some cases are allowed to deteriorate sufficiently, leaving no option except surgery. However, following surgery to remove only the portion of the disc pressing directly upon the nerve, the disc material left between the vertebrae must be therapeutically treated with exact exercise on precise equipment, and this precise equipment and its extreme value has only recently come to light. Prior to the appearance of this equipment, floor exercise was the norm, but floor exercise is only marginally beneficial. Proper equipment facilitates disc hydration and the body's lift dynamics return to normal within weeks. Without attention to disc health—a direct reversal in the cycle that originated this problem— and a re-teaching of proper body lift dynamics, chances are overwhelming that pain will return and surgery will reoccur.

CHEMICAL COMPONENTS OF DISC FAILURE

While a degenerating and collapsing disc is a mechanical process, not involving any pathogen, disc injury includes an accompanying chemical process worth mentioning: When a protruding disc touches a nerve persistently, the irritation causes inflammation. Swelling tissues aggravate the nerves even more. Adding to this, injury changes the chemical nature of the fluid within the disc from usual alkaline to more irritating acid. This chemical change compounds the sensitivity of the nerves, greatly increasing the sensation of pain. The chemical change can occur even without disc protrusion, called disc disruption syndrome. As with swelling, this acidity can only be removed by a significant amount of fluid exchange. The quicker disc fluid is cycled, the sooner pain will moderate. Thus the goal of treatment in acutely painful situations is to reduce swelling and wash away the pain-enhancing acid. Fluid exchange can only be increased through expanded motion of the disc, particularly increasing the pumping action well beyond what daily activity might normally provide. Obvious in acute situations, such disc therapy must be exactly done, causing little or no discomfort. Hence, the equipment and the provider cannot be haphazard.

SOFT TISSUES

In addition to the disc and vertebra, other tissues also support the spine. These are called soft tissues and can be divided into two categories: The first is muscle that I will talk about later. The second is connective tissue, tissue that attaches from one structure to another. Fascia, ligaments, and tendons are the names of these soft connective tissues. These tissues have a higher density of fibers than the disc. They are flexible and slightly elastic aiding the likely disc to absorb and disperse stress. These tissues have to be extremely strong for their size so there is little room for blood vessels. The few blood vessels present in connective tissue are like tiny, thin, plastic hoses. They have no strength on their own, depending entirely upon the tissue housing them for their strength, and similarly for their function. Thus, here again, as with the disc, these tissues face the problem of nutrition flow; how to get nutrition to peculiarly located cells. Swelling and inactivity jeopardizes these cells' lives. Knowing that the disc degenerates with inactivity, we now become aware that the situation is compounded throughout the back by similar circumstances in soft, connective tissue. At no time is the need of these cells to stay alive and function to full capacity more imperative than during injury and throughout healing. They must remain constantly capable of replacing injured tissue by continuing to create resilient proteoglycons. For this reason, a delay in exercise beyond a few days after the onset of pain lengthens indefinitely the term of the injury. Worse yet, when motion to connective tissue diminishes, fibers within soon begin to glue themselves together with little electronic bonds known as cross-links. Within days, the result is stiffer, less resilient tissue, tissue no longer flexible that can even tear when suddenly overloaded. Here again, to maintain the health of connective tissue, motion in the form of stretching movements emphasizing flexibility and elasticity speeds healing.

MUSCLES

Muscles are far more resilient than either the disc or connective tissue. It is unlikely that muscles are torn on the occasion of a back strain, and neither is muscle injury the explanation for prolonged recurrent pain. Even if muscles are injured, their

excellent blood supply rapidly repairs damaged tissue as in the case of severe traumatic injuries that often occur in violent athletics. Muscles, however, are key contributors to chronic back pain. Since spinal muscles are the only source of animation in the back and all other spinal components are inanimate, no component of the spine can adequately fulfill its role unless the muscles that control it function properly. This is why most back problems can be directly tied to inadequate spinal-muscle strength, or performance, or both.

Obviously, muscles are under control of the nervous system. When nerves are cut or even pinched, the muscles they control cannot work properly and may even experience pain. This sometimes happens when a bulging disc presses on the nerves controlling a muscle group, i.e. the leg hurts when the sciatic nerve is pinched in the back. Muscles also feed information back to the central nervous system. For example, the amount of effort a muscle must exert to accomplish a given task is fed back to the central nervous system for appropriate adjustment until the task is completed.

One other important connection of the nervous system to muscles is the autonomic system. The autonomic system allows emotion to influence muscle performance, and, among other things includes adjusting heart rate and blood supply. By modifying the sensitivity of specific muscle feedback organs (spindles) during peaks of anxious emotion, it directs the muscles to flex more readily and relax less quickly. Thus, anger and anxiety increase muscle tension, tension vital for self-defense but detrimental to a healthy back when one must depend upon one's mind, not one's body to fend off disaster. In today's stressful environment, severe muscle tension causes muscles to harden to the touch. In severe tension, muscles may even go into spasm. In light of this, the notion that emotional stress can be stored in the body is certainly not a myth; back problems often result from emotionally trying situations. Those who exercise regularly testify mightily to the psychological relief that exercise provides, even replacing depression with feelings of euphoria. This we know results from endorphin release—a natural high gifted to us by a grateful body as a reward for its healthy use—combined with muscle's opportunity to simply burn away accumulated stress.

A meaningful oddity of low-back muscles in humans is that they function in a unique manner compared with the same muscles in the rest of the animal kingdom. In humans, these muscles not only provide motion as is their role in animals, they also maintain the structural integrity of our lumbar spine, holding just the right forward curvature of the spinal column thereby, working with the discs, maintaining the appropriate space between vertebrae. This curvature is known as lordosis. Lordosis is natural and contributes to a more functional posture provided spinal muscles maintain adequate strength. Various scientific studies confirm that spinal muscles atrophy more quickly than any other muscle group when not utilized regularly. In the same regard, weakened spinal muscles respond extremely well to increased use.

SPINAL REFLEX AND DISC FAILURE

Because the spinal cord is vital to survival, nature provided the spine a remarkable ability to protect the delicate nerves it encases through instant and powerful reflex action of certain muscle groups. When a disc fails during an accidental fall from a chair or an inadvertent attempt to support an unexpected weight, the failure of a disc from such an

event probably had its origin long before the accident. The small, interspinal muscles I just mentioned as weakening rapidly when unused, when adequately conditioned have the natural ability, within milliseconds of anticipating the need, to lock our spine into a rigid, protective column called 'neutral-spine'. In our modern, sedentary society these important muscles fall into disuse, diminishing their reflexive capabilities and strength. Most people's back muscles—especially in people over 35—are unable to quickly and protectively 'lock down' their spine, leaving them infinitely vulnerable to injury, serious life-altering injury.

To avoid and correct spinal muscle dysfunction, one must understand how muscles achieve strength and maintain action. Of course they gain strength through exercise by growing and becoming bigger muscles, but when spinal muscles are underused for an extended period of time, the nervous system tends to alienate these inhibited muscles minimizing their function. Also, when the back is injured the body protects the injured component by modifying natural movement; muscles once working smoothly together, are now restricted from doing so. This is called inhibition. This barrier is often stronger than it needs to be, especially when pain is associated with anxiety and fear of re-injury. This barrier can only be overcome by aggressive physical training wherein the mind specifically instructs the muscles to override their nervous impulse and improve their function. This is called facilitation. Such training is accomplished by practicing the exact movements the back is expected to do—lift dynamics. In re-teaching lift dynamics, specific equipment isolates the group of muscles in question so that there is no escape from the job they are intended to perform.

Finally, something that should head the list in dealing with a painful back, a simple test for muscle strength. Since back function is completely controlled by back muscles, an essential step in resolving pain in the low back is to determine back-muscle strength. A simple, standard isometric technique—the Back Extensor Endurance Test—measures back-muscle strength by noting the time a person's back muscles can hold a constant unsupported position of the trunk with the prone body supported at the pelvis and the feet held. During this test, high static forces develop within the muscles, uncomfortable forces that determine muscle condition. Among all diagnostic procedures, monitoring back-muscle strength is singly the most important step in designing a program capable of restoring a back to pain-free function.

ANATOMIC SUMMARY

The joint between each vertebra is the disc. When injured, the disc has poor potential to heal itself because of limited nutritional supplies. The pumping action that supplies food to disc cells can only happen through special exercise. The connective tissue, whose role it is to be strong yet resilient as it maintains the relative position of various anatomic structures, may also lose its ability to respond to forces and become stiff and shrunken with inactivity. Repeated motion and stretching can avoid these occurrences. Muscles restricted by inhibition hinder an injured back's return to routine function until they are sufficiently stimulated—facilitated—until they perform in a strong, cooperative manner.

PHYSIOLOGICAL FACTORS

Acute pain is different from chronic pain. We have all experienced acute pain from a sudden soft-tissue injury such as a sprained ankle. The pain is immediate, but gradually resolves as the injured ankle heals. Chronic pain is different in that a persistent irritation of unhealed soft-tissue provides a constant low level of nervous system stimulation, eventually becoming a pattern. Chronic pain may even persist as neural memory long after the source of irritation has been modified or resolved. The adaptation of our nervous system to this ongoing stimulation is known as hypersensitization. Lesser activities that on previous occasion caused no pain, now will. Pain may be felt in areas not injured. Emotional distress for reasons of fear, anxiety, or depression also enhances hypersensitivity. It should be noted with keen interest that medications such as narcotic analgesics (pain killers) and muscle relaxants are known contributors to depression, again, enhancing hypersensitivity. The best solution to this psychological situation is to distract the nervous system, forcing the injured back to participate in more significant activity. Thus, active exercise in a controlled manner ideally distracts the mind, stimulating a break up of pain patterns embedded in the nervous system following a period of disability.

WHAT YOU CAN DO TO HAVE A HEALTHY BACK EVEN AFTER INJURY OR SURGERY

Active encouragement of normal back function is the best way to break away from chronic and recurrent pain in the low back. At the most basic level, healing begins with appropriate nutrition. This means adequate caloric intake in a balanced diet. If calories are only eaten as simple sugar—principally white bread, cola drinks, and candies—those calories not directly needed for energy are passed into fat; no one needs extra weight while healing an injured back. Food choices must include adequate protein as a source of building blocks for soft tissue repair, coupled with equal amounts of the complex carbohydrates found in fresh fruit and vegetables, mainly potatoes. Certain fats—butter is the best example—are excellent sources of minerals. Common sense meals selected from basic food groups and eaten only at regular intervals three times daily, easily supply everything needed by the body for effective healing.

Adequate rest is important. The best encouragement for sleep is physical weariness resulting from active exercise. Habitual inactivity does not supply a need for the deep sleep that is so helpful in physical and emotional healing. Ingestion of stimulants like caffeine just at bedtime are of course to be discouraged, and should be minimized throughout the day as well. Another stimulant that should be avoided is nicotine; smoking reduces the amount of oxygen the bloodstream can carry. Smoking also has the adverse characteristic of causing spasm in blood vessels, further diminishing nutritional supplies to already isolated disc and connective tissue cells. Additionally, smoking makes the nervous system more sensitive. As noted, narcotic medications as well as muscle relaxants lead to depression; should they be prescribed, their intake should be reduced to the lowest level. And, there is no evidence that anti-inflammatories do anything to speed healing; they may even retard healing. The use of heat or cold, or liniment or massage as a mechanism for pain control is certainly safer and more positive than drugs.

HOW TO TREAT THE INJURED STRUCTURES IN A PAINFUL BACK

Injections, medications, and manipulations, even surgery, while they occupy a valuable place in treatment, pale compared to exercise in stimulating the healing process. The natural stimulus to healing, and the only one we know that really works, is active, spine-specific exercise. For, following treatment to quiet pain, a sedentary back will never achieve its once enjoyed painless performance without active exercise. Active exercise means we use our nervous system (mind) to tell hesitant, reluctant muscles what to do. Active exercise means we progressively push ourselves to greater physically demanding activity than just walking, sitting, and climbing stairs. Active exercise means we strengthen spinal muscles, hydrate discs, improve spinal-muscle coordination, and restore elasticity and flexibility to the torso.

COMPONENTS FOR AN ACTIVE EXERCISE PROGRAM FOR THE LOW BACK

The first component as we begin to exercise is an aerobic warm up. Any light, two-minute aerobic exercise sufficient to elevate the heart rate just 25% is all that is required. The type of aerobics is by individual choice. Any form of inactivity, especially where injured tissue is involved, is usually associated with some progressive stiffness in the back, therefore, stretching logically follows aerobics. In stretching, it is necessary to push muscular and skeletal ranges of motion as far as tolerable in a controlled manner. Most range-of-motion back stretches can be done standing, but an exact device should be available facilitating a self-powered and leveraged low-back stretch, one that loosens the posterior ligaments of the spine. Precise equipment makes these critical stretches identically repeatable so that progress can be monitored and the degree of stretch standardized.

Muscle activation is the next step. Following warm up and stretching, the major muscle groups controlling the back, namely the hamstrings, gluteus, and spinal columnar should be gently challenged through their complete ranges of motion and effort. Again, precise equipment contains each movement within a similar, safe, repeatable routine allowing measurement of progress as well as establishing consistency.

The most critical element and the one missing from most back-exercise routines, is a method accelerating disc hydration. As noted, a pumping force within the disc is the only mechanism by which exchange of disc fluid can occur, and without disc fluid exchange, no new disc cells can be generated. Simple and effective disc hydration can be accomplished by alternating the body's weight as it is loaded onto and then removed from the disc. The effect of this loading and unloading is maximized when the force of gravity is completely absent at the peak of flexion—bending forward at the waist—with full flexion lasting a few seconds. Better yet, minimal hip rotation in the forward bend transfers movement to the lumbar area, improving the chance that vertebrae will separate. Again, a precise exercise device does this efficiently and consistently.

Removing muscles from our skeleton results in our bones collapsing into a heap. So it is with the back; weakened back musculature needs to be challenged in a specific, standardized manner until it adequately controls the posture of the low back. I have already stated that back-muscle strength is by far the most important component in achieving a healthy back. No matter what treatment may be administered to a painful, dysfunctional back, a back with insufficient muscle strength will not perform safely for

long before succumbing once again to pain. Knee surgeons follow knee surgery with months of a strict regimen of leg exercise, carefully monitored until the leg is fully strengthened and the knee joint fully capable of healthy, pain-free performance. Back surgeons, and everyone else in the back business, release partially treated backs back into normal routines with complete disregard for the same proven process. It makes no sense, but it explains the state of back pain in America today.

My own research of specific extensor muscle activity done in a gradual controlled manner is that pain gradually reduces and perception of increased back strength rapidly occurs. In fact, I have documented that re-injury is less likely if back strengthening is accomplished rather than if the pain is relieved merely with repeated stretching or other methods.

SUGGESTIONS FOR DAILY LIVING

While nothing substitutes for exact back exercise formatted on precise equipment, other back-aids are available. Available today in specialty back stores is an extensive and inclusive list of products specifically designed for back support. One need only examine our daily routine, seeing what our backs do most of the time—stand/walk, sit/recline, and lay down—to discover where they need support. Standing/walking should be done in shoes of an exact fit. Shoes should have level or slightly raised, shock-absorbent heels. Socks of natural fibers are better than thin, synthetic types. Sitting and reclining should be done in chairs orthopedically designed to: 1) adjust the thigh to a parallel line with the floor, 2) support the lumbar, 3) support the arms, and 4) allow for the shifting of body weight front-to-back and back-to-front to avoid fatigue. The seat in an automobile should have the same capabilities. A mattress should be firm enough to support our weight without buckling in the middle. It should be soft enough to allow hips, buttocks and shoulders to sink in somewhat and still support the torso and legs. Our pillow needs to provide sufficient support to keep our neck straight as our head settles into it. Pillows should not be particularly resilient. As with good food choices and appropriate exercise, the wise selection of supportive equipment for our backs will make a significant difference in recovery from and prevention of back problems.

SUMMARY

Back pain is the most common musculoskeletal problem facing healthcare today. The reasons so many backs get into trouble have been reviewed, and, while there are real anatomic explanations, they are overwhelmed by societal explanations. Since the vast majority of troubled backs result from muscles weakened by inactivity and backs ill-supported throughout the day, it is clear that society's lack of muscle-building exercise and back-supporting surroundings as part of daily routine jointly bear the blame. Gradually returning an injured back to full duty through tailored, spine-specific training and proper support not only heals it, but protects it from future injury. Unfortunately, in the modern medical environment pressure on individuals to heal themselves is rarely discussed. People are encouraged to *feel* better and mistakenly provided drugs to chemically help them do so, but a mechanism by which they can truly *get* better is seldom, if ever, emphasized. The principles of treatment I have covered here are straightforward, easily understood, and highly successful. Control of active exercise and

the creation of spine-supportive surroundings are very much under the healthcare provider's direction and the sufferer's capability. We have today at our command the power to create significantly better health. Let's take advantage of it.