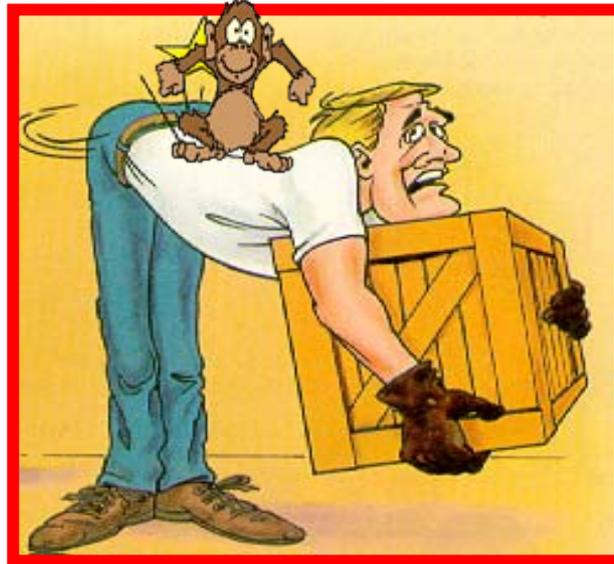
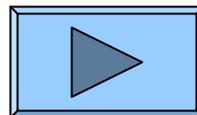


Training and Qualifications Program Office
Back Safety Short Course



Press continue here to



Bill Fortunato

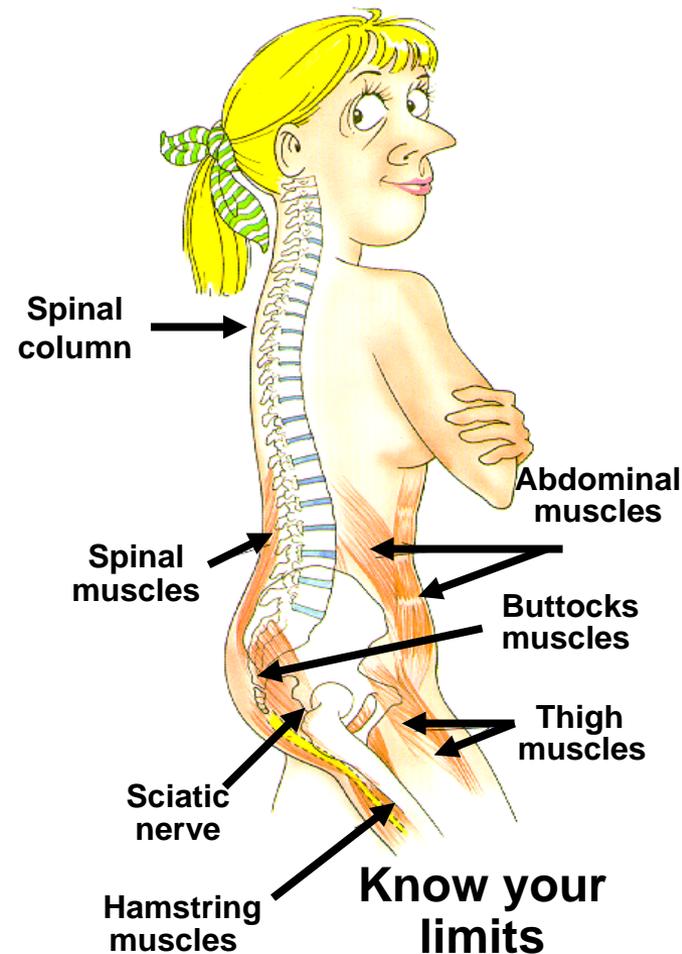
Telephone Extension: 7368

Email Address: fortunato@bnl.gov

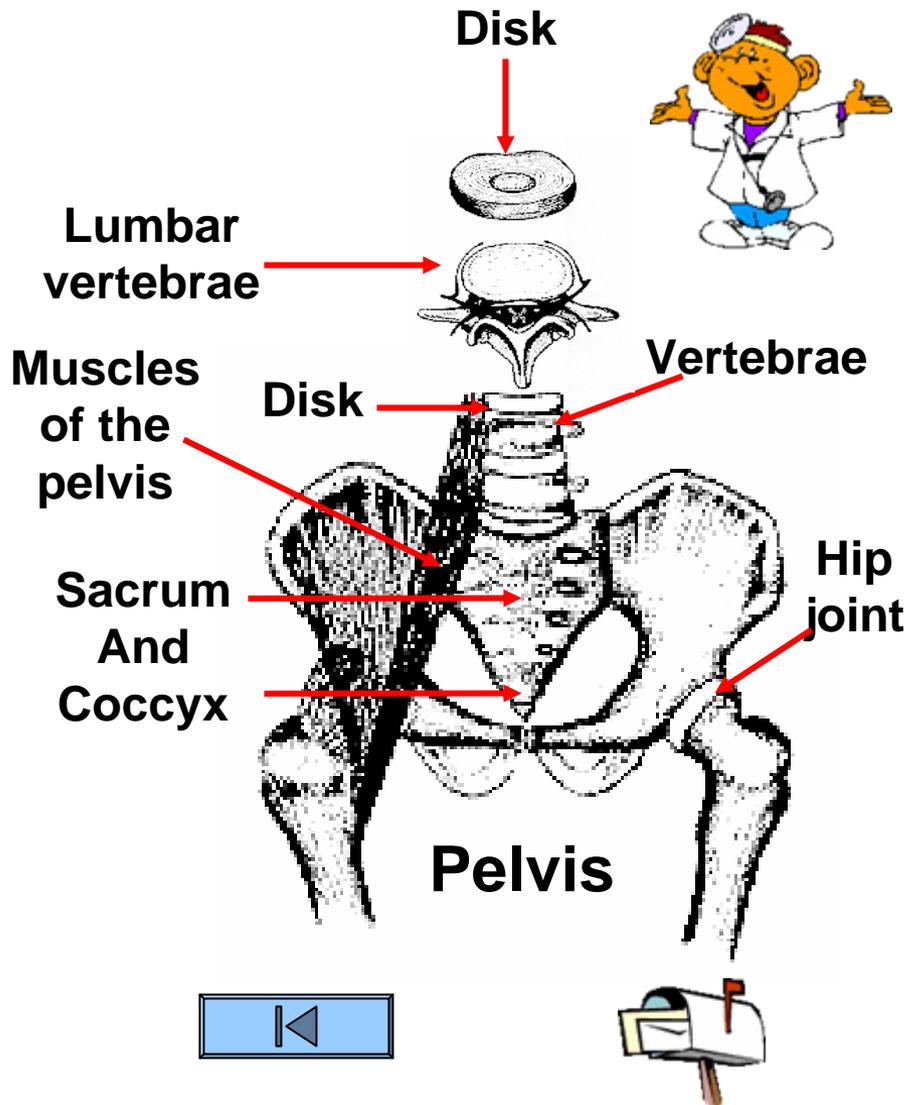
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Allied Back Components

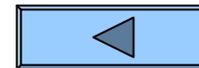
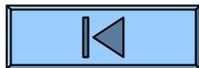
- Knowing how your back works, along with its allied components, will help you understand why things go wrong with it:
 - The back is a powerful but delicate machine upon which much of your body depends.
 - It supports the skull, ribs, pelvis and shoulder bones.
 - The back houses the spinal column, which contains and protects the spinal cord.
 - All the parts that make up and support a healthy, flexible back (bones, disks, nerves, muscles, and ligaments) work together to allow you to move smoothly.
 - If any one part of the back is overtaxed, other parts may suffer.



The Human Spine



- Your vertebrae are separated by disks -- flat, round structures with tough outer tissues and jelly like centers.
- Disks act as shock absorbers, cushioning the vertebrae as your spine moves.
- The bones of the upper legs fit into the hip bone sockets and large muscles in the thighs, abdomen, and buttocks determine the tilt of the pelvis.



The Human Spine

The spine is divided into 4 natural curves, two forward and two (balancing) backward

1. Cervical Curve (7 Vertebrae)

Located in the neck, these vertebrae function to support, tilt, bend and turn the head. The cervical curve forms the first/top natural curve in the spine and is more flexible than any other part of the spinal column.

2. Thoracic Curve (12 Vertebrae)

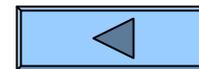
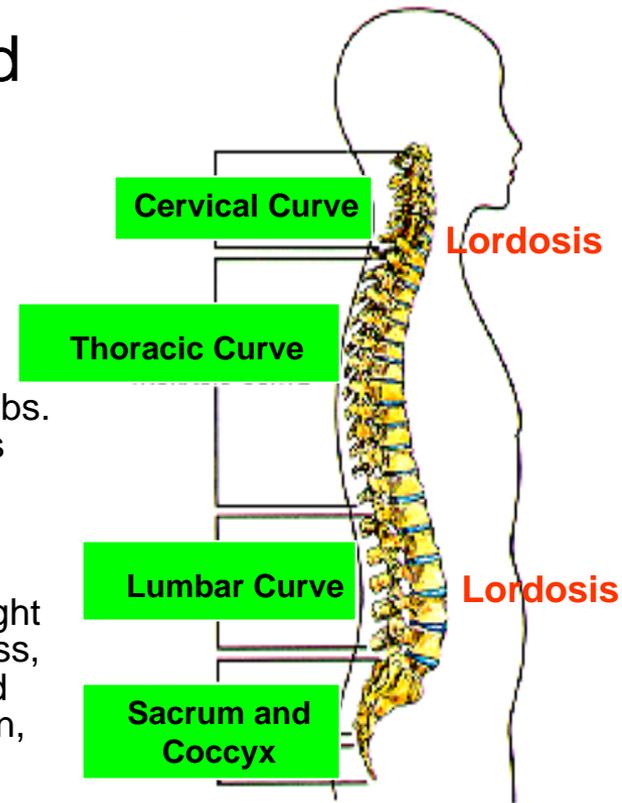
Located in the mid-back, these vertebrae function to support the ribs. The thoracic curve makes up the second natural curve, but it does not move as much as the other spinal vertebrae.

3. Lumbar Curve (5 Vertebrae)

Located in the low back, these vertebrae carry the most body weight and form the third natural curve of the spine. Under constant stress, the lumbar spine is the site of most back pain -- because we stand upright most of our body weight falls squarely on the lumbar region, making it prone to wear and injury.

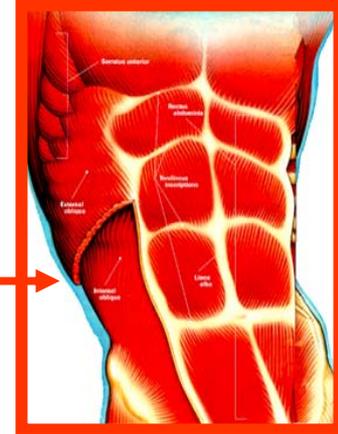
4. Sacrum and Coccyx (9 Fused Bones)

Together they form the fourth natural curve (tail bone).



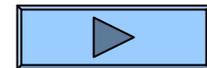
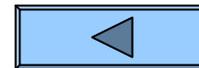
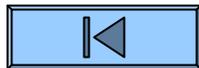
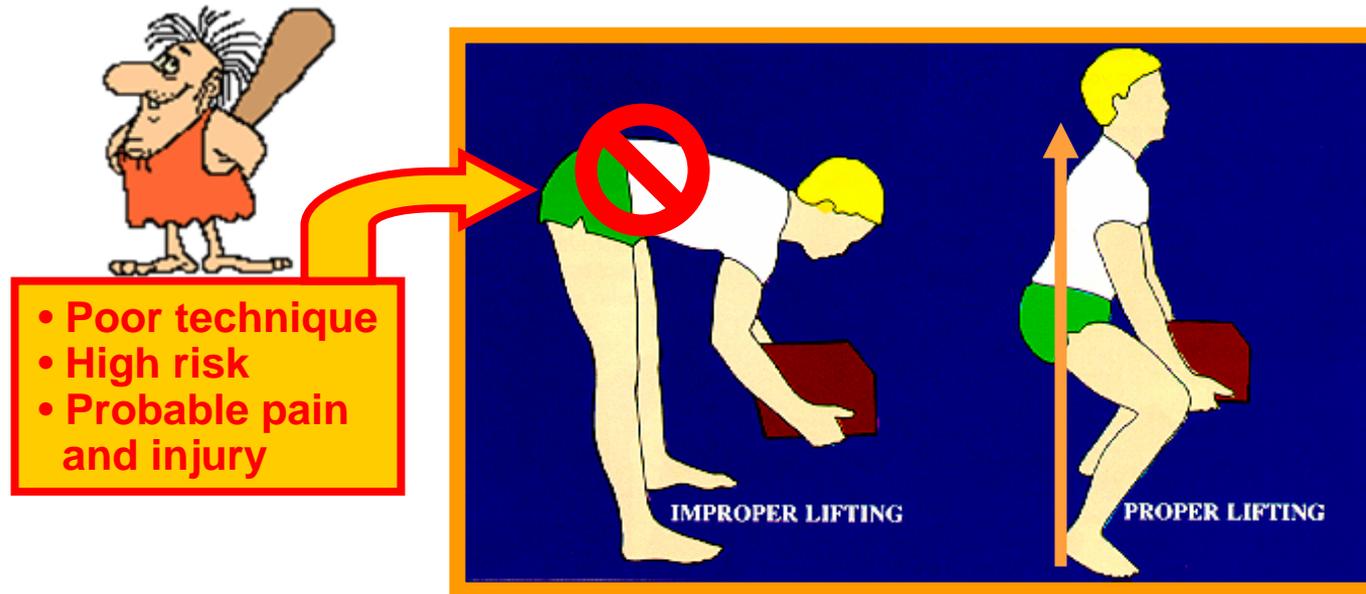
Working Relationship Between Abdominal Muscles And Lower Back

- Importance of Strong Abdominal Muscles
 - Some 80% of all Americans will experience low-back pain in their lifetime.
 - If you are a weekend athlete, have poor posture, an imbalance in upper/lower abdominal area strength, and are overweight, you're even more at risk.
 - You don't have to be an anatomy expert to realize that when it comes to back pain, weak abdominal muscles are often the culprit.
 - **Abdominal strength is the glue that keeps your back strong.**
 - **Your back's strongest ally is its abdominal muscles.**
 - Abdominal muscles support the back, and without the assistance of back and stomach muscles, your spine would collapse.
 - Strong abdominal muscles are critical to general health, good fitness, and a strong, pain-free back.
 - That's why people with low-back pain invariably sport abdominal muscles that are much weaker than their lower-back muscles.



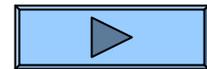
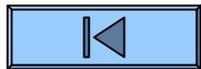
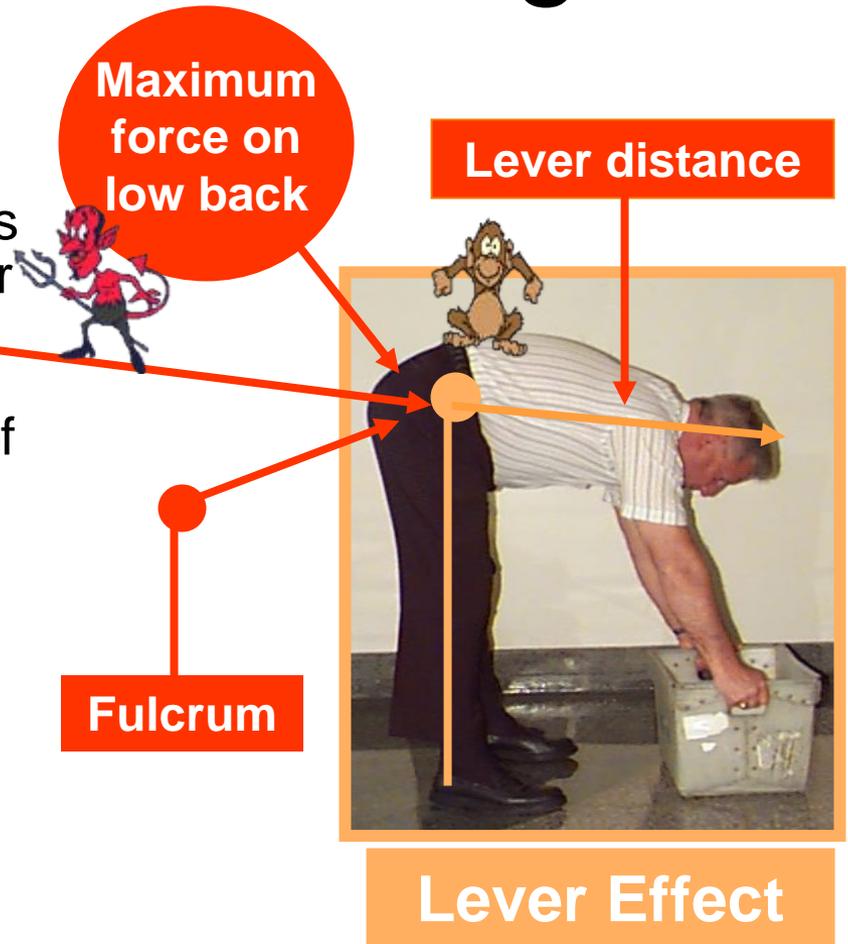
Dynamics of Proper Lifting and Moving Skills

- Lifting is athletic, and requires the right training and technique – just like a sport.
- Most people lift the wrong way, consequently most back injuries result from improper lifting.



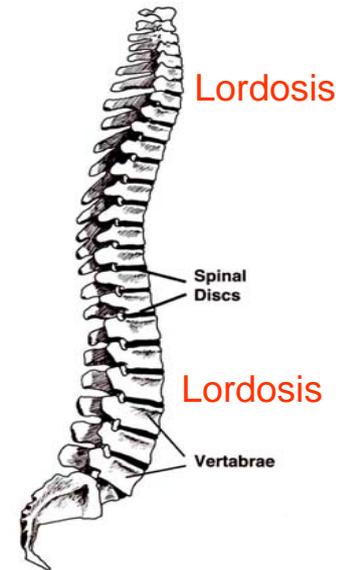
Biomechanics of Lifting

- According to the principles of biomechanics
 - The worst lifting situation occurs when the body is extended over the load (**Lever Effect**).
 - The lower back becomes a fulcrum supporting the weight of the body plus the load.
 - Twisting in this position invites injury.
 - Keep your back upright to shift weight onto the powerful leg muscles and reduce the lever effect.

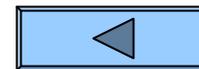


The “S” Curve And Stabilization

- The “S” Curve And Stabilization
 - Maintain the natural hollow S curve of your back/spine (lordosis) throughout the lift by locking your back muscles to minimize your risk.
 - The muscles brace the spine and protect motion segments.
 - In doing so, you stabilize your spine which reduces low back strain.
 - This stabilization can be thought of as “muscular fusion.”



Maintain the natural “S” curve on your lumbar spine while lifting



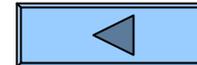
The 5 “L’s” of Lifting

Think about the 5 L’s of lifting to remind yourself about correct lifting habits and posture (i. e., load, lungs, lever, legs, and lordosis).

3. Keep the load close to your body thereby reducing the **lever** effect:
 - The closer the load is to your spine -- the less force it will exert on your spine.
 - Move so close that you feel as though you’re hugging the load.
 - Get a firm, safe grip.
 - Keep your feet apart to establish a stable and balanced base.
2. Just prior to lifting the load inhale, and as you lift, breath out through pursed lips (**lungs**):
 - But, don’t hold your breath.
1. Always test the weight of the **load** before lifting, and:
 - Know the weight and center of gravity of the load.
 - Plan and think about the lift:
 - Conceptualize -- visualize the biomechanics of the lift.
 - Recite correct lifting techniques to yourself.
 - If too heavy, get help.
 - Tighten your stomach muscles -- abdominal muscles support your spine when you lift and they can act like a brace for your back, holding it in proper position.
 - Lock your back muscles.
 - Bend your knees, not at the waist.



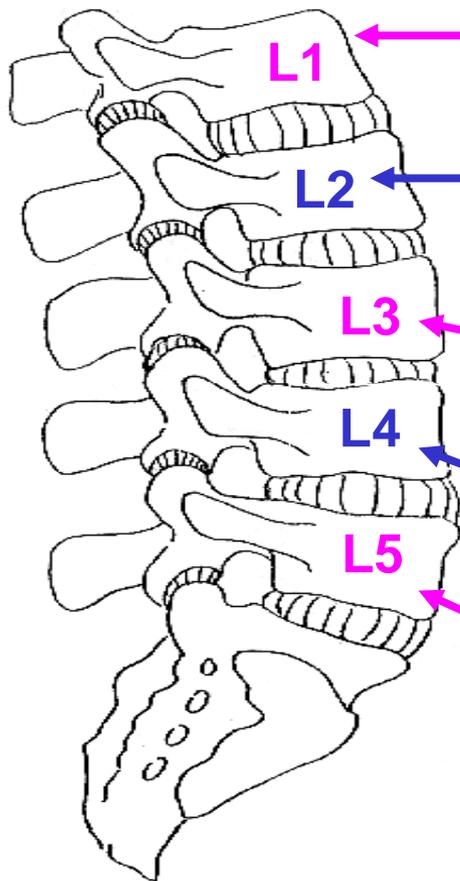
4. Always use your **legs** and not your back while lifting:
 - Your leg muscles are much more powerful than your weaker back muscles.
 - Keep your back upright whether lifting or putting down a load -- don’t add the weight of your upper body to the load.
 - Avoid twisting -- it can cause injury.
 - Lift slowly and smoothly.
 - Avoid jerky movements.
5. Maintain the hollow (S curve) in your back throughout the lift (**lordosis**):
 - It’s a good sign if you feel as though your buttocks is jutting out as you lean forward.



The 5 “L’s” of Lifting

Alternate Way To Remember The 5 L’s of Good Lifting Habits

L
U
M
B
A
R
S
P
I
N
E



L1, Load

Always test the weight of the load before lifting. If too heavy, get help.

L2, Lungs

Just prior to lifting the load, inhale, and as you lift, breath out through pursed lips.

L3, Lever

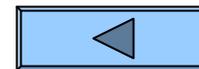
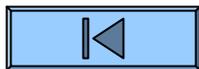
Keep the load close to your body, thereby reducing the lever effect.

L4, Legs

Always use your legs and not your back while lifting.

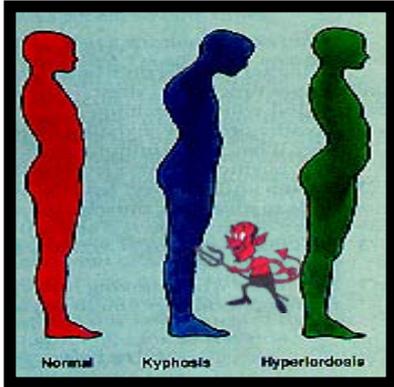
L5, Lordosis

Maintain the hollow (S curve) in your back throughout the lift.

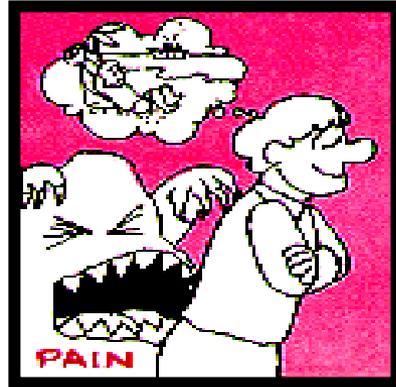


Common Causes of Low Back Pain

Back trouble is frequently caused by illness and traumatic accident -- or:



Poor posture



Improper standing



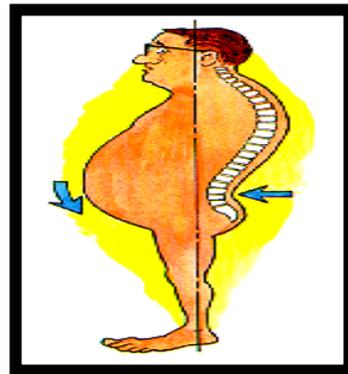
Improper lifting/bending



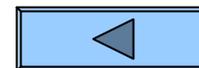
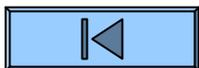
Improper sitting



Excessive weight and weak abdominal muscles may cause a spinal imbalance

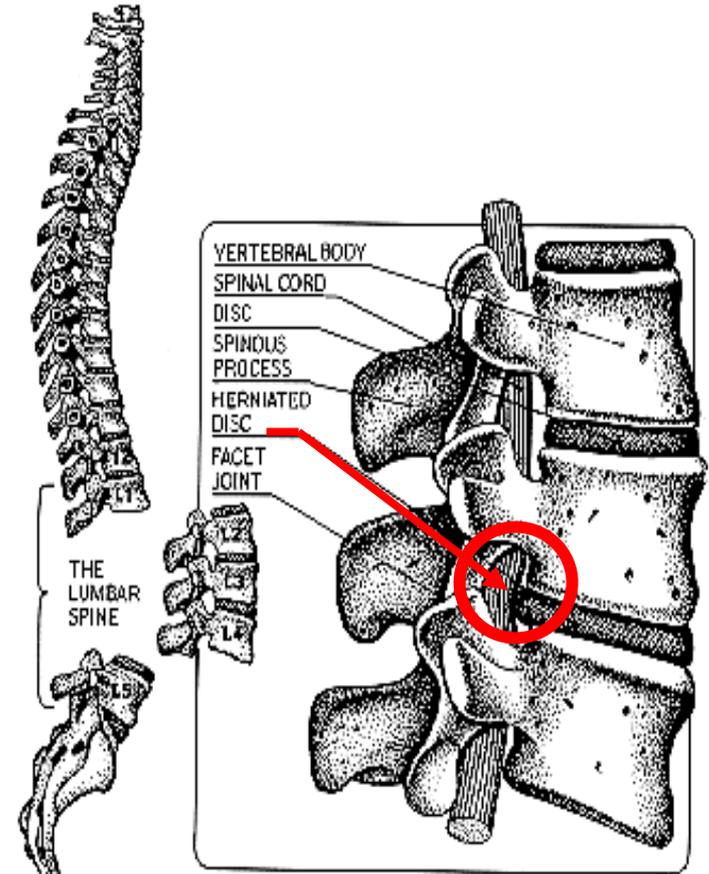


Infrequent exercise

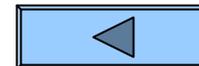


Common Causes of Low Back Pain

- Prolapsed, Ruptured or Herniated Disc
 - This condition is sometimes called a slipped disc, although this term is not quite accurate.
 - A prolapsed disc is a condition in which a disc between two vertebrae bulges, or herniates. This can sometimes place pressure on nerve endings.
 - In more severe cases, the disc actually ruptures, spilling some of its jelly-like contents -- often, the sciatic nerve is affected.
 - The two sciatic nerves are the largest nerves in the body. They begin in the lower back and extend to the legs. Someone with sciatica, therefore, often feels pain in the lower back as well as along the back of the hip and outer side of the leg.



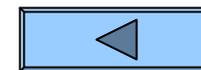
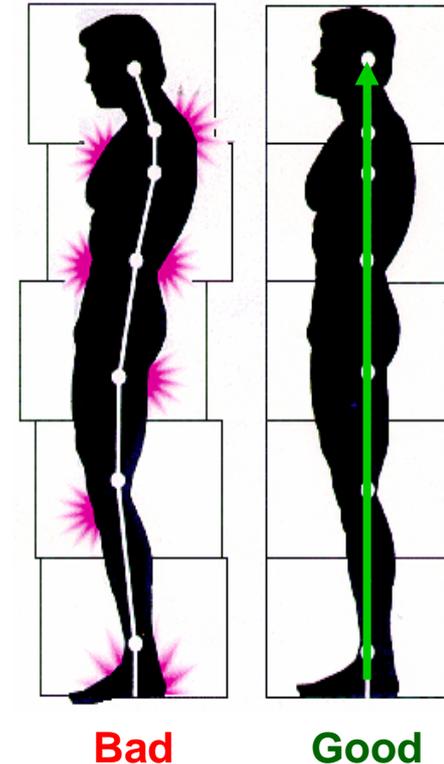
Herniated Disc



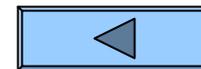
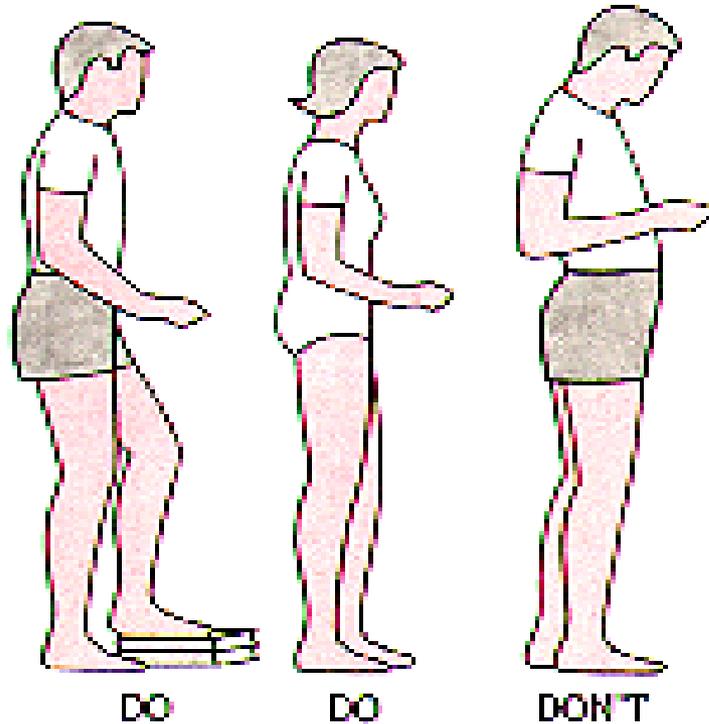
Activities That Put The Back at Risk

- Bad Posture

- Bad posture puts unnatural and continuous strain on the curves of the back -- this can put the spine out of balance increasing its vulnerability to injury.
- Stand tall -- keep your head high (upright), chin tucked in and pelvis tilted forward to avoid “swayback” -- a deep curve between the waist and buttocks, which puts pressure on the spine.
- Hold shoulders square -- don’t slump forward or tensely raise shoulders toward your head.
- Tighten abdominal muscles.
- If you are standing properly, your shoulders and hips will align with an imaginary line running from your ankles to your ears.
- Keep one foot forward, knees slightly bent.
- If you must stand in the same position for a prolonged period, shift your weight frequently, if possible by alternatively resting your feet on a stool or large book.



Activities That Put The Back at Risk



- Standing

- Stand tall -- head up, shoulders back, pelvis forward.
- Keep one foot forward, knees slightly bent.
- If you must stand in the same position for a prolonged period, shift your weight frequently, if possible by alternatively resting your feet on a stool or large book.

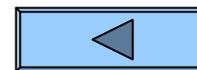
Activities That Put The Back at Risk

- Bending

- Bend your knees and hips when working low.
- Make sure the object is close to you when lifting, and keep it close when carrying.
- Keep one foot forward.
- Keep your back as straight as possible and your knees bent.
- Avoid bending your waist – this can strain and injure your back.



Bend from the knees when leaning over

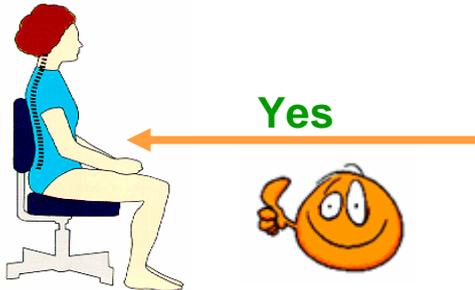


Activities That Put The Back at Risk

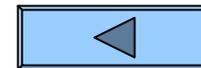
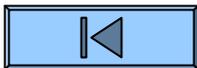
- **Sitting**



Avoid slouching forward



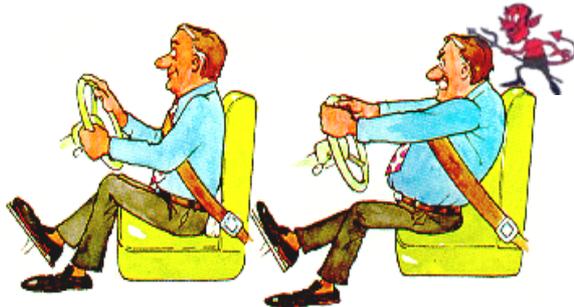
- Sitting is one of the biggest causes of strain on your back.
- Sitting can place high loads on the lower back, in fact, sitting can be twice as hard on your back as standing.
- Slouching makes the ligaments, not the muscles, do all the work. They stretch-and hurt-and put pressure on the vertebrae.
- Good sitting will help keep your spine in balanced alignment and avoid backache, fatigue, or even back injury:
 - Never sit with your back unsupported for long periods of time -- sit with your back pressed against the back of the chair.
 - Sit slightly reclined, knees higher than hips -- achieve this by placing your feet on a book or stack of books. Dangling legs put a strain on your lower back.
 - Always sit with your feet flat -- if you must cross them, do so at the ankles only.
 - The best chair is one with a back that is supportive and flexible.
 - If you don't think your chair provides enough support, place a rolled-up towel between the small of your back and the back of the chair.



Activities That Put The Back at Risk

- Sitting While Driving

- Move the seat close enough forward to reach instruments and pedals easily-- be cautious of the airbag inside the dash board.
- You should be able to work the pedals without stretching your legs.
- Sit with your back flat against the seat.
- Put a pillow behind your back if necessary.
- Keep your knees higher than your hips.
- Stop from time to time to rest during long-distance drives.



Yes

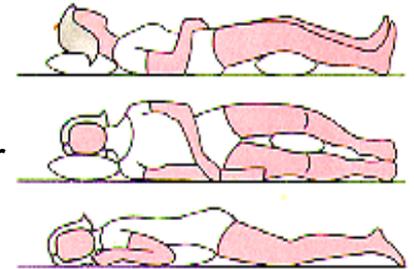
No



Activities That Put The Back at Risk

- Sleeping

- Sleeping rests the back -- when you are lying down your back doesn't have to support your body weight.
- Lack of sleep can rob every part of your body, including your back, of energy and stamina.
- Your bed mattress should be firm but not uncomfortable.



Good sleeping posture

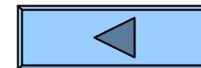
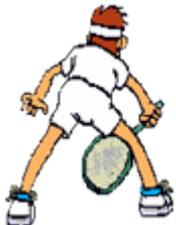
- High Heels

- Although fashionable, wearing high heels is not without risk.
 - High heels place strain on the back, increases the risk of a back-injury from slips, trips and falls, and habitual wearing of high-heeled shoes may lead to swayback.
 - Wear supportive shoes with low or flat heels and non-slip surfaces.



- Sports

- Certain sports, and specific activities associated with a sport, significantly increase the chance for back injury due to:
 - Overloading and stressing of joints, muscles, ligaments and tendons
 - Lack of adequate physical conditioning

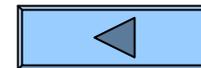
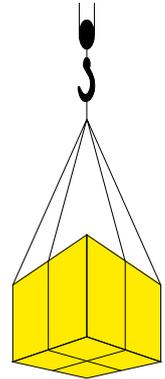


Alternatives to Manual Lifting

- Mechanical Help

- If a manual lifting task is beyond your safe, effective and efficient lifting capacity -- use mechanical help.

- Hand trucks, carts, pallet movers, elevators, forklifts and overhead cranes can help avoid chances of strains and injuries while minimizing the physical demand of a lifting and carrying task.
 - If material handling equipment is to be used, ensure that “pre-requisite” BNL training and qualification requirements for an operator are satisfied.



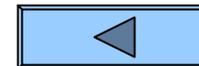
Ergonomics and Prevention

- Ergonomics and Prevention of **Cumulative Trauma Disorders or CTDs**
 - The Occupational Safety and Health Administration (OSHA) states: “the science of ergonomics seeks to adapt job and the work place to the worker by designing tasks and tools that are within the worker’s capabilities and limitations.”
 - Today, implementing ergonomics in the workplace is recognized as one of the best ways to minimized on-the-job stress and strain and to prevent CTDs.
 - CTDs are subtle injuries that can affect the muscles, tendons and nerves at body joints, especially the hands, wrists (e.g., carpel tunnel syndrome), elbows, shoulders, neck, knees and back.
 - CTDs most frequently occur as a result of strain from performing the same task on a continuous basis. This strain can slowly build up over time, until the worker eventually experiences pain and even difficulty using the injured part of the body.

How can I do it easier



Adjust lifting tasks to minimize the range of motion and difficulty while maximizing comfort and ease. To reduce strain, rearrange your work area to keep your arms close to your side, elbows in. Lift loads at a level between the waist and shoulders. Reach for high objects by standing on a ladder. Avoid straining and stretching up.



Ergonomics and Prevention

- High CTD Risk Factors

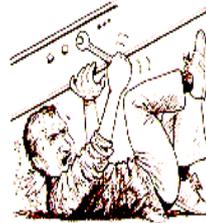
- There are several factors that place you at increased risk of developing a CTD, including:



Repetitive Motion



Excessive Force



Awkward Posture

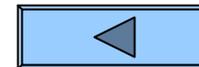


Vibrating Tools



- Other factors that can place you at risk for developing CTDs include:

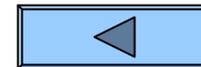
- Working in a cold environment
- Working with vibrating tools



Ergonomics and Prevention

Application of Ergonomics

Step #	Key Word	Description
1	Analyze 	Analyze the risks you may be exposed to on a particular job.
2	Minimize 	Minimize identified risks by finding ways to reduce repetitive motion and excessive force.
3	Neutralize 	Neutralize awkward postures that may cause strain and tension by placing your body in a natural, relaxed position. In a neutral position your shoulders and back are relaxed, your neck is straight and your arms and elbows are close to your body.

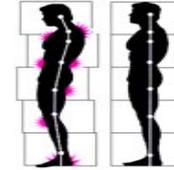


Back Health and Fitness

- **Back Fitness Essentials**

- To enhance your back fitness and reduce the risk of injury, you need to improve your habits in five areas:

1. Posture -- flawed posture stresses the back
2. Lifting -- overestimating what your back can do
3. Relaxing -- tension causes muscles spasms
4. Flexibility -- a lack of flexibility contributes to stiffness
5. Strength -- muscles thrive on work -- use it or lose it



1. Posture



2. Lifting



3. Relaxing



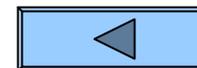
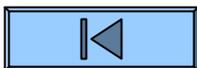
4. Flexibility



5. Strength

- **Build a fit back**

- Learn how to exercise, and -- make exercise a routine part of your life style.
 - Engage in a cross-training exercise program.
 - Maintain strong and conditioned abdominal (stomach) muscles.



Back Health and Fitness

Physical fitness actually has four components:

The American College of Sports Medicine recommends a physical conditioning program that includes exercises to improve your fitness in all four areas listed below -- this is often referred to as cross-training:

1. **Aerobic Fitness**
2. **Muscular Fitness (Anaerobic/Resistance Training)**
3. **Flexibility (Stretch and Flex)**
4. **Body Composition (Weight Management/Body Fat to Lean Muscle %)**



4. Body Composition



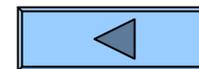
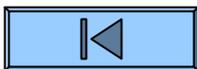
1. Aerobic Fitness



2. Muscular Fitness



3. Flexibility



Back Health and Fitness

Life Time Pursuit

- To be physically fit, you simply need to understand that:
 - Physical fitness is a lifetime pursuit.
 - You must engage in a regular program of exercise such as walking, plus.....
 - If you stop exercising, your fitness gains will be lost over time -- regression starts within 2 weeks of stopping exercise.



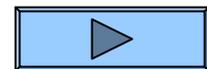
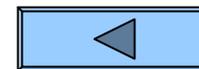
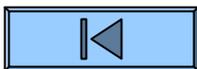
There are no miracle fitness pills

Note:

- According to the Centers for Disease Control and Prevention, and the American College of Sports Medicine:
 - Every U.S. adult should accumulate 30-60 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week.



Get up and start moving!



The End

- Do you have any questions?
- Do you have any comments?

