MUH 104

Occupatıonal Health And Safety

II

HACETTEPE ÜNİVERSİTESİ
Uzaktan Eğitim Uygulama ve Araştırma Merkezi

Physical And Ergonomic Risk Factors

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What Will We Learn?

B-PHYSICAL RISK FACTORS

3.Light (Lighting)

- a) Characteristics of good lighting
- b) Improper and inadequate lighting
- c) Lighting types

4.Temperature

5.Pressure

6.Radiation

- a)Natural sources of radiation
- b)Artificial radiation sources
- c)Methods used for protection from radiation

What Will We Learn?

C-ERGONOMIC RISK FACTORS

1.Purpose of ergonomics

2.Topics of ergonomics

3.Errors in office layout

4.Office exercises

5. Protective ergonomics principles against low back pain

Light (Ligthting)

The third physical factor that we will study is light and lighting.

According to the regulation on health and safety measures to be taken in workplace buildings and add-ons (Annex-1 (22) (23) (24))), it is essential that the workplaces are sufficiently illuminated by daylight.

In cases where the daylight is not utilized sufficiently due to the subject of the work or the construction style of the workplace or at night shifts, appropriate and sufficient lighting must be provided with artificial light.

Lighting systems in the workplaces and passageways must be of the types that will not create any accident risk for the employees and are placed accordingly.

Characteristics of Good Lighting

Good or high quality lighting should:

Have sufficient intensity according to the job performed,
Be at constant/unchanging intensity
Be well spread,
Not produce shade,
Have suitable light color and reflection,
Not create dazzling environment

Inappropriate Or Insufficient Lighting

On the other hand,
inappropriate or insufficient lighting:

Stretches the nerves,
Causes eye and body fatigue,
Reduces vision efficiency,
Makes it difficult to do work,
Reduces the efficiency of the work,
Impairs the quality of work,
Causes economic losses in the workplace,
Threatens the safety of vehicles and pedestrians.

Lighting Types

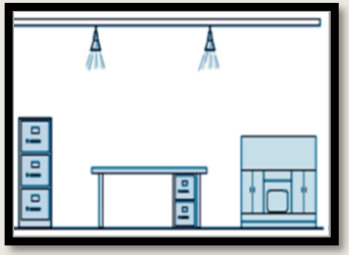
Let’s discuss the lighting types. In case of natural lighting is not available or not sufficient, we use artificial lighting. Artificial lighting is the electric lighting in places where daylight is not enough or where night work/shift is performed. We have three classifications for indirect lighting.

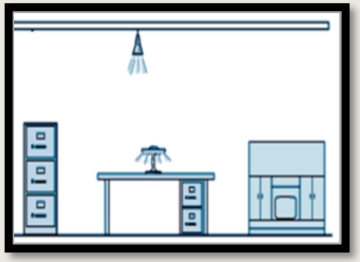
1. Direct
2. Indirect
3. Semi-direct (Local)

If the light comes directly to the working area, it is called direct lighting.

If the light comes to the working area by getting reflected from other surfaces, it is called indirect lighting.

If the light illuminates only the working area, it is called semi-direct or local lighting.





Temperature

The 4th physical risk factor that we will discuss is temperature which is the basis of thermal comfort.

Thermal comfort is the condition of mind that expresses satisfaction with the thermal environment and is assessed by subjective evaluation. The human body can be viewed as a heat engine where food is the input energy. The human body will generate excess heat into the environment, so the body can continue to operate. Temperature, humidity, air velocity are the basic thermal comfort factors.

Heat is a term that quantifies the energy in transition. Hot bodies lose their energy by heat transfer to the colder environment. Temperature is a measure of the average energy of molecular motion in a substance and expresses how cold or warm an object is. It is the main parameter of thermal comfort.

Workplace ambient temperature is measured by dry (mercury) thermometers.

Pressure

Pressure is the force applied perpendicular to the surface of an object per unit area over which that force is distributed.

The sea level atmospheric pressure is equal to 760 mm of mercury.

People working under significantly higher or lower pressure than atmospheric pressure may experience heart, circulatory or respiratory distress.

Radiation

Radiation describes any process in which energy emitted by one body (via particles) travels through a medium or through space, ultimately to be absorbed by another body.

Radiation can be classified according to the effects it produces on matter, into ionizing and non-ionizing radiations.

Ionizing radiation includes cosmic rays, X rays and the radiation from radioactive materials.

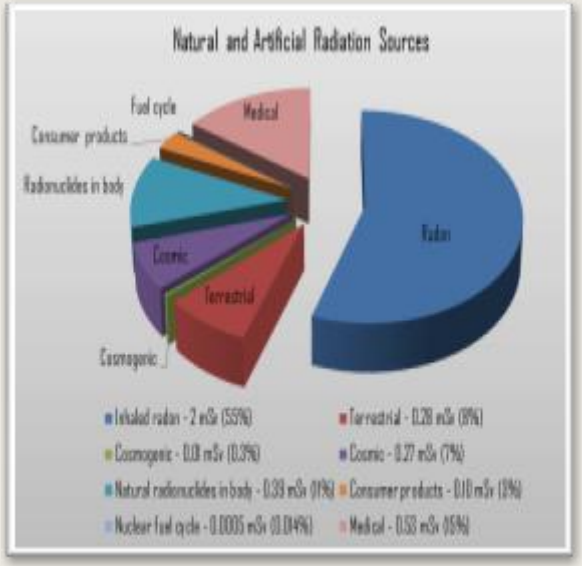
Non-ionizing radiation includes radiant heat, radio waves, microwaves, terahertz radiation, infrared light, visible light, and ultraviolet light.

The purpose of radiation protection is to provide an appropriate level of protection for humans and to prevent the occurrence of harmful effects.

Natural Radiation Sources

Natural radiation sources are:

- Cosmic rays
- Alpha, beta and gamma rays emitted by short half-life radio isotopes
- Radioactive elements in our body
- Radon gas emitted as a result of disintegration of the radium.



Artificial Radiation Sources

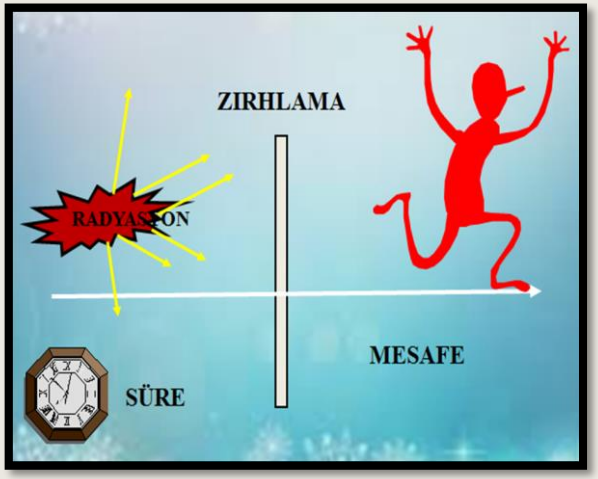
- Diagnostic and therapeutic uses in medicine
- Nuclear power plants
- Atomic bomb trials (1950-1960)
- Some consumer materials (tv systems, lightning rods, luminescent clocks, etc.)
- Coal and phosphate rocks
- Industrial radiation sources etc.

Basic Protection Methods from Radiation

1. TIME: Time is the duration that the person exposed to radiation interacts with the source. It should be as short as possible since Dose = (Dose Intensity) x (Time)

2. DISTANCE: Radiation intensity is inversely proportional to the square of the distance. The distance should be as large as possible.

3. SHIELDING/BLOCKING: For an effective protection, a suitable barrier should be placed between the radiation source and the person. This is called shielding.



Ergonomic Risk Factors

Ergo: Work
Nomos: Science (Laws)
Ergonomics: Work Science (Greek)

Ergonomics is a branch of science that aims to learn about human abilities and limitations, and then apply this learning to improve people's interaction with products, systems and environments. Ergonomics is the process of designing or arranging workplaces, products and systems so that they fit the people who use them. Ergonomist's work includes the employee, workplace and work design.

Purposes of Ergonomics

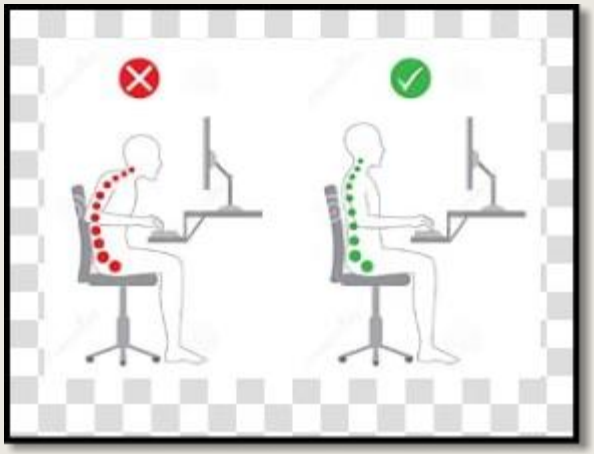
To prevent accidents and injuries,

To minimize fatigue and excessive use of the human body, absenteeism, loss of time, accident and discomfort,

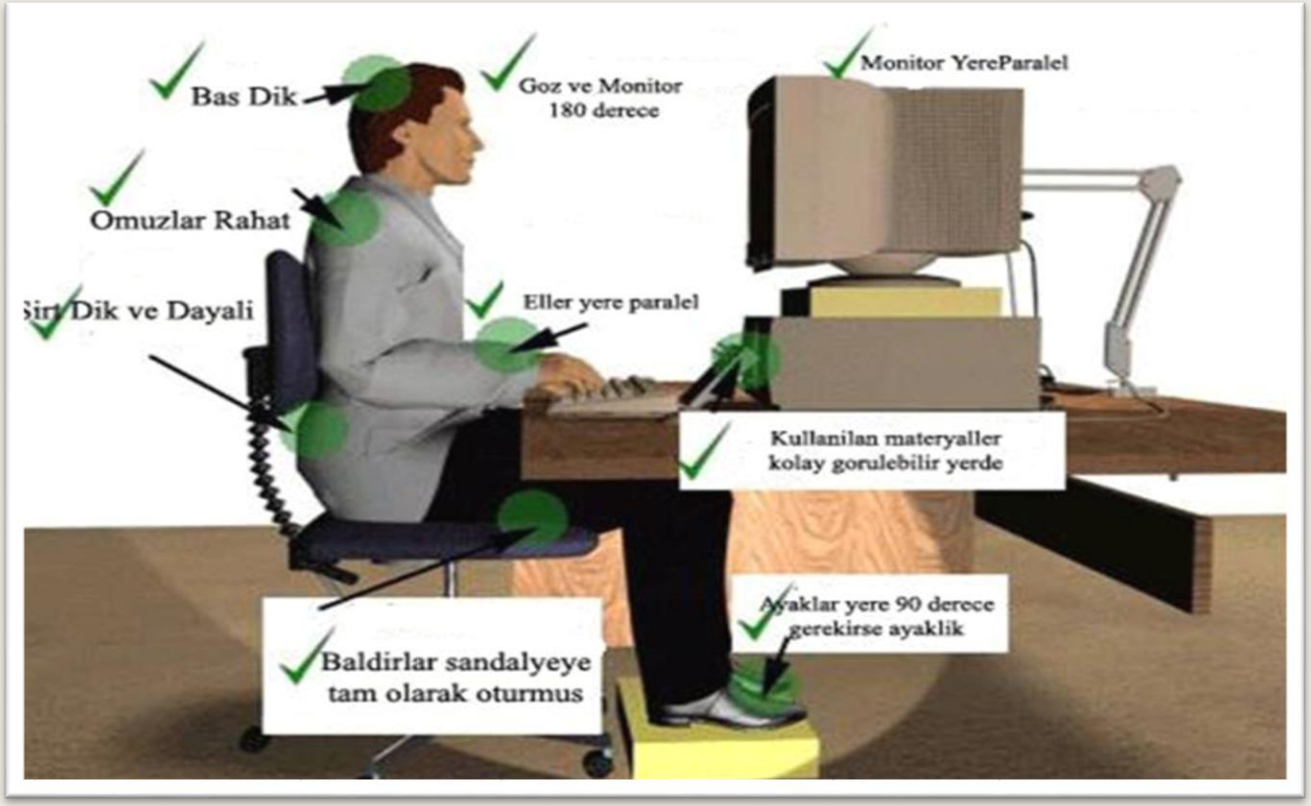
To maximize efficiency, quality, safety, comfort and productivity.

Topics of Ergonomics

- Ergonomics deals with noise, lighting, heat, vibration, workspace design, hand tools design, machine design, chair design, shoe design and work design, working hours, shift, break times, food regime, etc.

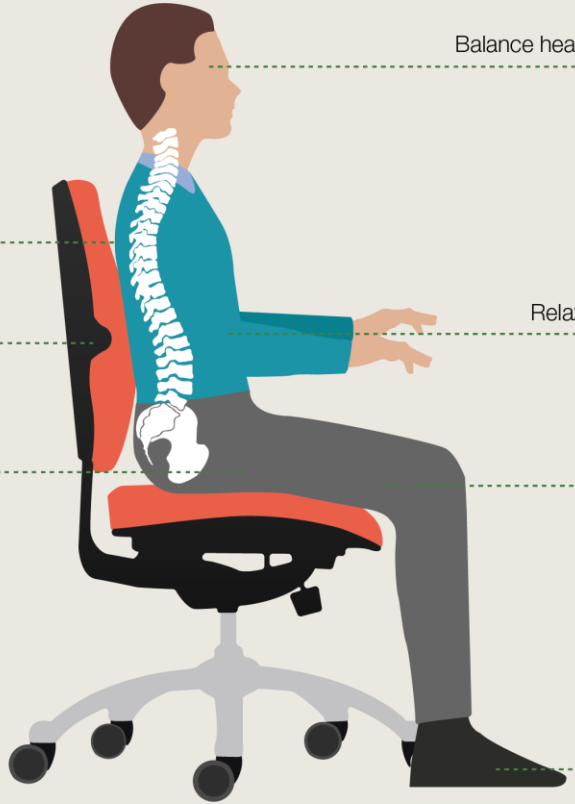


Ideal Sitting



Ideal Sitting

Sitting Up



Balance head

Maintain contact between your back and the seat back

Keep lumbar spine supported

Position hips slightly above knees

Relax arms at right angle to desk

Leave gap between backs of knees and seat

Keep feet flat on floor

Common Mistakes in Office Design

Mistake: Very dry air caused by the heaters (radiators) in the office environment.

Result: Lung disorders, bronchitis, common cold, eye and skin diseases, dry eyes, skin rashes, increased allergic sensitivity.

Thermal Comfort

For adequate thermal comfort;

- Air temperature: Light physical work: 18.3° C, office work: 19.4 °C - 22.8 °C, heavy industrial work: 12.8° C - 15.6 °C,
- Moisture (relative humidity) should be 70%.
- The room must be ventilated continuously.

Common Mistakes in Office Design

Another common mistake is spending excessive time in front of a computer without a break.

Result: The negatively charged particles emitted from the computer monitors create a negative electric charge in the human body and eyes, attracting positively charged dust particles in the air, causing conjunctivitis in the eyes.

Common Mistakes in Office Design

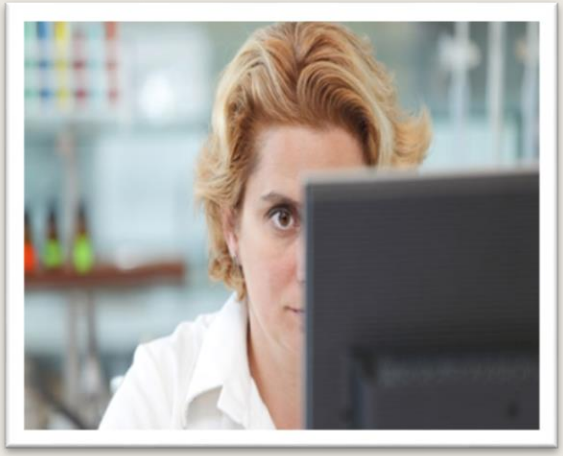
Mistake: Light source (window, lamp, reflector, etc.) just in front of the work area.

Result: Glare and eye ailments, headache, even if the screen is suitable for use, because the work area is illuminated incorrectly.

Common Mistakes in Office Design

Mistake: The wrong position of the screen (monitor) and light reflections caused by the window in the eyesight or behind the person.

Result: Serious mental and perceptual load and eye strain.



Common Mistakes in Office Design

Mistake: The absence of dynamic, orthopedic, healthy sitting suitable for human anatomy.

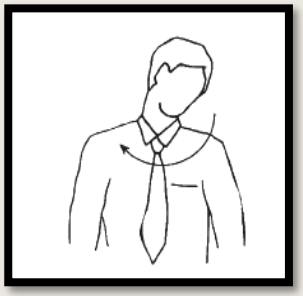
Result: Chronic back, neck, waist discomfort, cramps, muscle aches and strains.

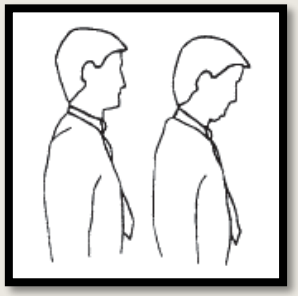
Office Exercises

Slowly turn your head to the right and left respectively; wait for 8 seconds.

Wait for 8 seconds by slowly moving your ears closer to both shoulders.

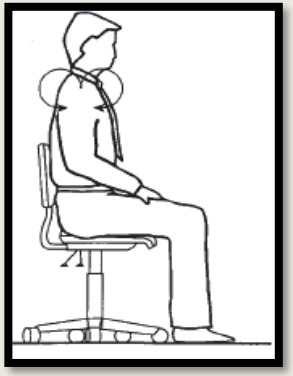
Try to stretch the muscles behind the neck by bringing your chin closer to the front. Wait for 8 seconds.



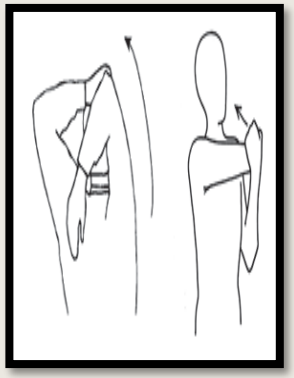


Office Exercises

Lift your shoulders towards your earsa nd wait for 3 sec. Then try to rotate it forward and back 5 times in circular motions.

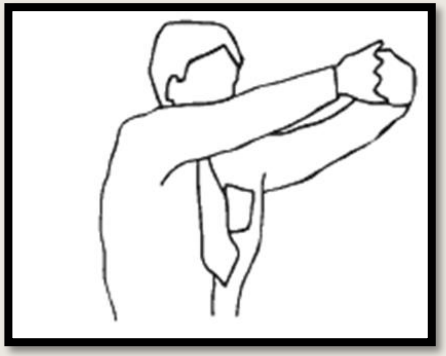


Grasping your elbow from behind with your hand, try to stretch it in the opposite direction. Then bring it closer from the front until you feel tension towards the opposite shoulder and wait for 8 seconds.

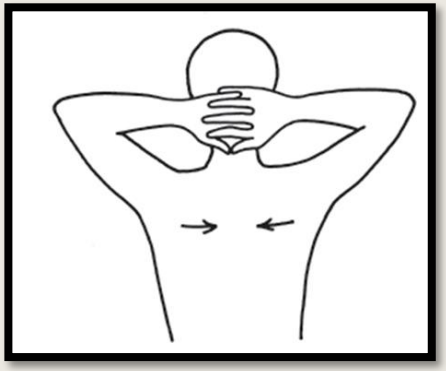


Office Exercises

Stretch your elbows without breaking your elbows with your fingers inward, with the palm up. Wait for 8 seconds.



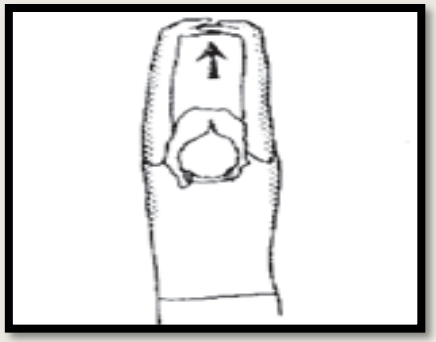
With your hands in the same position and behind your head, move your elbows away from the back and wait for 8 seconds.

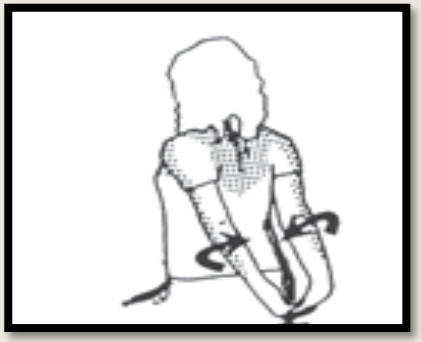


Office Exercises

With your palm up, wait for 8 seconds by leaning to the left and right.

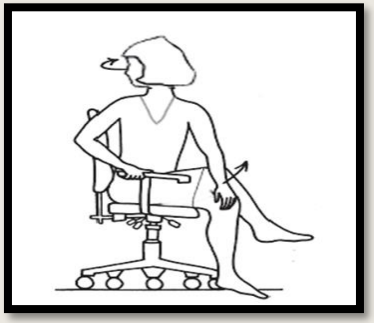
Wait fot 10 seconds by crossing your hands at the back, bringing your shoulders closer back, pitting your waist.





Office Exercises

With your foot in contact with the ground, turn your knee and trunk in opposite directions until you feel tension.



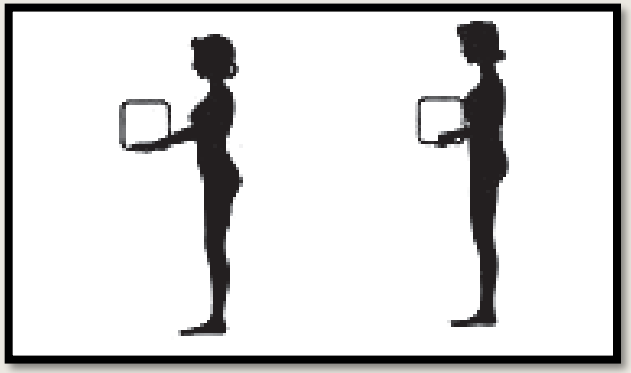
Slowly raise your leg. Turn your ankle in a circular motion, then stretch back and forth for 10 seconds.

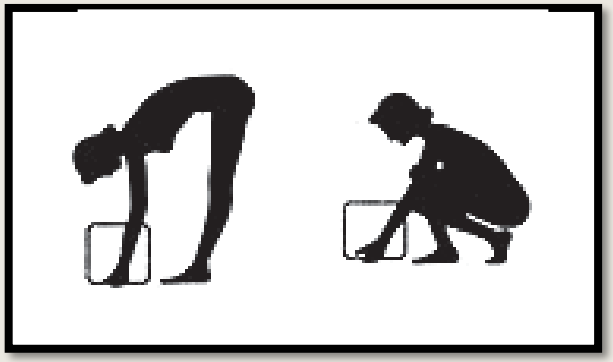
Protective Ergonomic Principles Against Back Pains

- When you need to stand or sit for a long time, placing a stool under your feet will prevent your spine from straining.

Protective Ergonomic Principles Against Back Pains

- When carrying any weight, keeping it close to your body will reduce the load on the lumbar region.
- When you need to lift a weight from the ground, it is healthier to lean over your hips and knees instead of your waist.

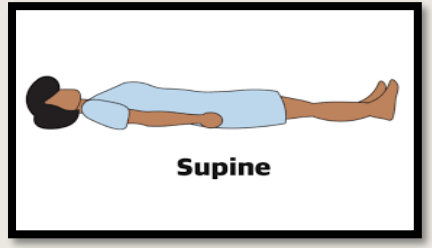


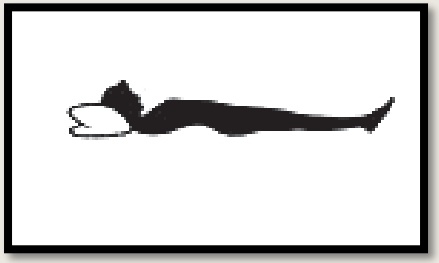


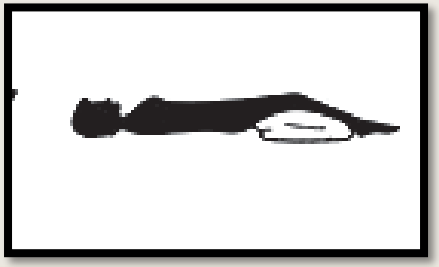
Protective Ergonomic Principles Against Back Pains

If you experience low back pain, do not sleep in a supine position or with a very high pillow,

It is recommended that you put a pillow of sufficient height under your knees.







Protective Ergonomic Principles Against Back Pains

It has been shown that protection, ergonomics training and ergonomic improvements reduce the frequency and cost of low back pain by more than 50%.

Thank You

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