

Has your back ever started to hurt while sitting in a chair for a long time? Have your fingers or wrists ever started to hurt while using a computer or playing a video game for too long? These pains might seem like just a nuisance, but they can become very serious problems that interfere with how well people work or do their daily activities. Preventing these types of problems is the work of ergonomics engineers.

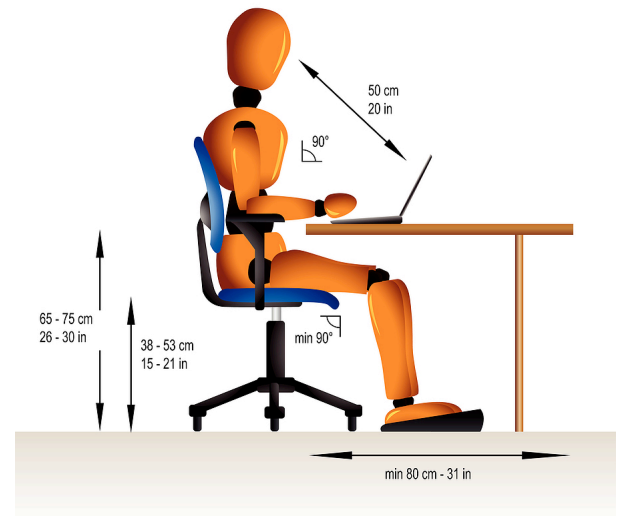
## Ergonomic Engineering

The term "ergonomic" comes from two Greek words: "ergon," meaning work, and "nomoi," meaning natural laws. In this branch of engineering, engineers work to improve the design and construction of tools, furniture, and other equipment, so that they better fit the human body. For example, ergonomics engineers have spent years designing office chairs that people can sit on comfortably for hours at a time.

Ergonomics engineers also analyze the way people perform jobs or use tools in order to determine how to minimize strain. For example, you might have heard that you should lift a heavy box by bending your knees, not your back. This advice comes from the work of ergonomics engineers. Ergonomics engineers apply math and science principles to make the physical demands of home, school, and workplace environments easier on the human body. Proper ergonomic design can prevent injuries and long-term disabilities.

## Ergonomic Risk Factors

Everyone is at risk for some sort of injury on the job, at school, or even while relaxing. Those whose work involves lifting, pushing, pulling, or carrying of heavy objects are the most obvious at risk for physical injury. But even when the work does not involve anything that most people consider strenuous or physically difficult, it can cause problems. Workers who sit at computers all day can get repetitive strain injuries in their hands and arms. Students who sit with awkward postures at desks for long periods of time or carry



An ergonomics engineer might study how people sit in a particular type of chair, and apply that information to design a chair that better-fits a person's body. An improved design would help prevent injury from sitting for long periods of time.

heavy backpacks from one shoulder may notice pain in their backs or shoulders. Even athletes are can be susceptible to ergonomic risks. “Swimmer’s knee” and “tennis elbow,” are also caused by repetitive actions.

The level of risk for injury depends on how often and how long a person performs these compromising activities.

## **History of Ergonomic Engineering**

As long as humans have been making tools, they have been exploring how to improve them. In ancient Greece, the famous physician Hippocrates wrote a description of his opinions of the best arrangement for equipment and tools in a surgeon’s workplace.

Later, in the Industrial Revolution of the 19<sup>th</sup> century, early ergonomic engineers applied scientific and engineering principles to the workplace to make factories more efficient. By carefully analyzing every motion a worker performed, often with a series of photographs, these ergonomic engineers aimed to reduce unnecessary motions in order to increase the amount of work a single worker could do.

World War II sparked the development of newer, more complex machines and weapons. These developments created different demands on an operator’s skill and awareness. As a result, ergonomic engineering principles were applied to everything from crafting airplane cockpits that contain simpler and better-organized controls to designing safer and easier-to-use parachutes.

## **Basic Principles of Ergonomics**

An ergonomic engineering analysis typically involves several steps.

First, an ergonomic engineer selects the problem to be solved or improved. For example, a student may complain of a backache. Next, the engineer conducts investigations to observe and analyze how the student spends the majority of his or her time. For example perhaps the student uses a computer for many hours throughout the day or repeatedly exercises with only one specific piece of equipment.

To assess the fit between a person and the equipment or device they use, ergonomic engineers consider the activity

that is carried out and the demands the activity places on the user's body. They also re-evaluate the equipment's design, taking into consideration the equipment's size, shape and purpose.

Once the observations have been made and analyzed, the engineer might propose to modify the repeated actions or the tools that are used throughout the day. For example, the engineer might propose that a student spends less time in front of a computer. Alternatively, the engineer might recommend a change to the design of the equipment the student is using, or a change in the way the student is using it.

Finally, once the improvements have been made, the ergonomics engineer conducts a new set of observations to determine if the problem persists. If it does, the engineer will try new approaches.

These are only some of the challenges posed to ergonomic engineers. What other physical challenges do you think people are faced with at home, school or the workplace?