
The Science of Sitting

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By Kevin Logue

We customarily think of an on-the-job back injury as a result of a worker lifting a heavy object causing an acute injury with immediate and intense pain. As we've moved from the industrial age to the information age with more and more employees spending their workdays seated, another culprit has emerged: THE CHAIR...

Improper seating may cause not only back pain but also neck pain, eye strain, abdominal pain, leg pain, and repetitive motion injuries (RMIs). What makes this more problematic is that it works insidiously. Months, even years, may pass with substantial medical expenditures incurred before the sitting posture is identified as the source of the problem.

We have been slow in identifying seating as a potential cause of RMIs, perhaps because sitting is ordinarily thought of as a way of relaxing. Yet 70% of the American workforce now sit on the job. Most of those workers also sit on the way to work, during meals, and in the evening to watch television or read.

The root of the problem lies in a fact that seems counter-intuitive: the human body is not made to sit for extended periods of time. We are designed to be upright, walking, running, and on the move. Sitting and standing still for extended periods are detrimental to our health. We are hunters and gatherers, not hunters and peckers!

Anatomy of Sitting

How does sitting cause back pain? Its effects are multifaceted. Sitting in a typical slumped posture stretches the ligaments and muscles that extend the back, weakening them over time. The stretched position causes back extensor muscles to be chronically active. This low-level activity can cause a decrease in circulation to the working muscles resulting in pain and spasms. These muscle pains and spasms may be exacerbated by stress. One of the most common responses to stress is muscle tension especially in the areas where the body is weakest. Because of sedentary lifestyles, lower back muscles have become one of the weakest areas of the body.

When we sit, we transfer the entire weight of the upper body to the buttocks and the thighs. The skin and muscles flatten out and the bony structure of the buttocks (ischium) pushes into the soft tissue. The fat and muscle tissue that are in contact with the ischium slowly move out and away from the bone leaving the skin as the last barrier before the chair.

As this shift happens, pressure is increased because there is a reduced amount of tissue to disperse the weight. The remaining tissue, mainly the skin, sustains pressure high enough to reduce blood flow. Thus, the longer you sit, the more the tissue moves away from the bony structures, causing increasing pressure on the remaining tissue. The first noticeable symptom of this increased pressure is a burning sensation under the ischium. If the person remains sitting, the burning increases until they move or the skin dies. When the skin dies it is referred to as decubitus ulcers or pressure sores.

Getting the Proper Fit

Current research encourages us to challenge our ideas about sitting. Over an extended period of time, all sitting positions strain the body. However, with variation and movement, we can avoid these strains. When sitting perfectly balanced, movement is easy. But when one is not perfectly balanced, movement requires considerable physical effort.

While computer use in the workplace is considered "forward working", we aspire to position the chair of the computer user in a "neutral posture". This posture consists of the following criteria:

1. The hips should be higher than the knees. When the hips are higher than the knees, there is less forward torque to the pelvic girdle and thus less strain to the lumbar spine.
2. The back is fully supported and straight (open) not forward.
3. The seat pan should allow for a "gap space" of two to four inches between the front edge of the chair and the back of the knee. When the seat pan is too short it can irritate the sciatic nerve. If it is too long it can reduce blood flow to the lower extremity.
4. The seat cushion needs to be constructed with materials that allow equal distribution of the applied load which increases surface area contact between the tissue and the seat.

Most importantly, even when sitting in "neutral posture", the best position is the next position. Our bodies need movement and circulation to work efficiently. One needs to get out of their chair and move at least five minutes per hour. These microbreaks will increase the body's blood flow and reduce fatigue.

Nearing the End

Each day workers across the country sit on chairs that are not suited to their tasks. And, for an alarming number of workers, this results in physical discomfort and serious injuries. In contrast to past ideas about sitting correctly, we now know that it is best to change positions often when seated for a prolonged period. Workers need movement and variation to be comfortable. How people sit depends on what they sit on. The "correct" chair should encourage physical movement without requiring conscious thought. Just as there are many different types of work, there must be different work chairs to meet the particular task needs. Work, home, and recreational environments increasingly require long periods of sitting often with traditional seats that are uncomfortable, the wrong size, or too hard. Common environments with poor seating include the workplace, home, automobiles, aircraft, and sporting and recreational events. Poor seating leads to problems with various levels of discomfort. Proper seating leads to a reduction in fatigue, enhanced blood flow, comfort, and productivity.

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