

# Optimizing Biomechanics for the Production Arborist

By Amanda Carpenter, PT, DPT, CProT, CEAS

According to The Oxford English Dictionary, biomechanics is defined as the study of the mechanical laws relating to the movement or structure of living organisms. The importance of human movement is becoming widely accepted as a key to health and survival. Chronic sitting has been found to be an increased risk for health issues, including type 2 diabetes, cardiovascular disease, cancer, and even death. The headline “Sitting is the New Smoking,” recently coined by Dr. James Levine, Director of the Mayo Clinic at Arizona State University, is gaining popularity. Being in a seated position is not the problem with sitting; the problem is being inactive with little movement for 60–90 minutes. Any sedentary position for greater than 60 minutes is problematic to human health due to a reduction in blood flow to tissues.

Many people hit the gym before or after their workday as a way of offsetting the effects of sitting. However, performing repetitive motions, such as running like a gerbil, under artificial lights, while also breathing recycled air in a climate-controlled environment, is not what humans are designed to do. The human body is designed for multiple movement patterns in different planes of motion. These movement patterns have been referred to as primal movements, which include crawling, jumping, sprinting, walking long distances, pushing, pulling, climbing, and

carrying. The life of a hunter-gatherer depended on these motions. The human body is designed for motion in a variety of patterns that our modern-day lifestyle has minimized. After six million years of hunter-gatherer existence, humans are now sitting for a majority of the day, indoors and out of the elements. As our most basic human needs for shelter and food have become easier to obtain, our overall health has declined.

According to the U.S. Occupational Safety and Health Administration (OSHA), workers in many different industries and occupations are exposed to risk factors at work, such as lifting heavy items, bending, reaching overhead, pushing and pulling heavy loads, working in awkward body postures, and performing the same or similar tasks repetitively. It has been determined that exposure to these known risk factors for musculoskeletal disorders (MSDs) increases a worker's risk of injury.

I find it interesting that in modern life, the risk factors for a work-related injury include those same primal movements required for the survival of our hunter-gatherer ancestors. If the human body is designed to move, and sitting is detrimental to our health, then why has it been determined that these movements are risk factors to developing a work-related musculoskeletal disorder? It is not movement that damages the body; it is the biomechanical



## Single knee to chest stretch.

Stretches the buttock, back, and posterior hip capsule.

Holding under the thigh and keeping it straight, bring your knee toward your chest, while keeping the opposite leg out straight. Hold for 90 seconds.

Repeat on opposite side. With all stretches and positions, stop if you have any pain or discomfort.

imbalance from repetitive postures and motions, combined with biochemical imbalances created by modern day diets and habits that are interfering with the viability of the musculoskeletal system. To put it simply, it is what humans are doing when they are not moving that is the problem.

## Being a production arborist can be beneficial to your health

Having grown up in a logging family in the 1980s and working closely with production arborists for more than 10 years, it is my observation that these occupations have physical demands similar to that of our hunter-gatherer ancestors. In addition to similar biomechanical movement patterns, additional parallels include working outdoors in a variety of weather conditions, as well as routinely interacting with nature.

Research has shown that being in nature and looking at colors associated with nature boost the immune system. Additionally, regulating core body temperature by exercising outdoors has been shown to burn more fat and calories. With the current rise in chronic health issues causing a decline in world health, I believe production arborists have a health advantage associated with their occupational requirements.

## The difference between the arborist and the hunter-gatherer

Today, production arborists:

- sit in elevated chairs and on elevated toilet seats
- drive to work and to job sites; run equipment for long hours
- perform repetitive job tasks, such as hand snipping, running chain saws, pole sawing, and raking
- perform static posture activities such as working from aerial lifts
- wear rigid work boots
- eat a different diet than our ancestors
- sleep less than our ancestors

These lifestyle and work-related practices can create biomechanical imbalances in the production arborist, causing stress on the body and increasing the risk of a work-related injury. Sitting on elevated surfaces and the use of modern toilets have reduced functional hip range of motion, causing strain on the knees and low back. Long hours of sitting to drive and/or static positions required to operate equipment reduce blood flow throughout the body, compromising the musculoskeletal system. Repetitive motions such as hand snipping and running a chain saw cause excessive strain on the entire upper body. Working from an aerial lift requires prolonged static postures. Wearing rigid work boots to protect the foot reduces the tri-planar motion of the foot and ankle, causing stress and strain up the mechanical chain into the knee, hip, and back, while also reducing balance input to the brain. The typical modern diet includes excessive



### Double knee to chest stretch.

Stretches the back, buttocks, and posterior hip capsules.

Grasping the back of each thigh, pull toward your chest, while keeping your thighs straight. Hold for 90 seconds. Repeat 2×. With all stretches and positions, stop if you have any pain or discomfort.

sugar and processed food product consumption, which contribute to inflammation. Chronic inflammation can compromise the strength of soft tissues, increasing the risk of a musculoskeletal injury. The body repairs itself during sleep, thus both the quality and quantity of sleep are extremely important to restoring and maintaining the health of the musculoskeletal system. Modern lifestyle factors such as technology, dietary habits, and increased stress interfere with our circadian rhythms and sleep cycles.

## Techniques to optimize arborist biomechanics

- hip stretching; see *Arborist News*, October 2016 (p. 72)
- progressive squatting
- eat a whole-foods diet
- consider job task rotation
- avoid or minimize sedentary positions for longer than 60 minutes
- change out of rigid work boots when not at work
- adequate rest and sleep: 1–2 days off per week; 8–9 hours of sleep/night; avoidance of technology 30 minutes before bed

Sitting and static postures lead to chronic health issues and are more detrimental to our health than repetitive motion. The human body is designed to perform a variety of movements in multiple planes of motion; *you are designed to move*. The conveniences of modern life have reduced our need to move. I believe arborists have a health advantage over the general population related to their job-related movement patterns and their consistent exposure to nature. By stretching the hips, working on squatting, eating a whole foods diet, rotating job tasks, limiting sitting or static postures to 60 minutes or less, changing out of work boots when not working, and

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## *Climbers' Corner (continued)*



### **Progressive Squat.**

The ability to squat properly has been lost by most people as a result of sitting in chairs and on elevated toilet seats. A proper squat requires adequate flexibility of the hips, knees and ankles.

Using a wall for support and balance. Slide down into a deep squat position, stopping when your heels begin to lift up. Keep your heels tucked toward your buttocks. You should feel the stretch in your buttocks and your calves. Progress toward eliminating the need for support of the wall for balance. Hold for two to five minutes. With all stretches and positions. Stop if you have any pain or discomfort.

getting adequate rest and sleep, the production arborist can optimize his or her biomechanics, while reducing the risk of injury and improving overall health.

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