



October is Ergonomics Month. This is a great opportunity to take a closer look at your work environment and ensure your workspace is set up to reduce the risk of musculoskeletal injuries (MSIs) while supporting your overall well-being.

BCFSC is pleased to have Dr. Delia Roberts, President of FitSafe Solutions Inc. and an expert in anatomy and physiology, biochemistry, kinesiology, and exercise science, to share her insights on ergonomics and how it can affect your health, comfort and performance at work.



Ergonomics, What Is It and Can it Help You at Work?

By Dr. Delia Roberts

Ergonomics is often described as a way to lower the loads exerted during physical work by adjusting tools and other equipment to be more comfortable. As it turns out, this is only one small piece of the science of ergonomics. According to the Canadian and the International Ergonomics Associations (IEA), ergonomics looks at the way that humans interact with surrounding systems, and not just the physical aspect of work. Instead, they also consider the cognitive and organizational parts of a person's environment (1). In fact, they consider human factors to be a term that can be used interchangeably with ergonomics (1)! This is a much broader definition than that used by organizations like the Occupational Safety and Health Administration in the United States and the government of Canada which state that ergonomics involves designing "workstations, work processes, equipment and tools to fit the employee" (2). Interestingly, the definition used by WorkSafeBC is much closer to that given by the Ergonomics Associations in that it includes interactions between people and their physical and organizational environments, though on their website they only talk about musculoskeletal injuries (MSI). Either way, ergonomics is a field of study that strives to reduce difficulties, increase well-being, and improve performance within the workplace.

In many situations ergonomics is thought to help reduce the risk of MSI because many of the tools we use today were designed before the concepts of how muscles and joints work were considered. This is especially true when the design of a tool or workstation forces the user into an awkward posture. When joints are not properly aligned the amount of force required to hold the tool or perform the movement can be increased or shifted to generate cross loading forces on a joint. While it sounds simple to suggest that changing the placement of a dial, controller or screen could relieve a sore neck, numb fingers or a painful back, in some cases making these kinds of changes can make a big difference. Reducing the constant stress on a muscle or joint affects how a person feels, so there are many situations where ergonomics can help.

Unfortunately, often making changes to tools or systems is not always this straightforward (3). For one, the nature of the work sometimes makes demands that cannot be changed. For example, chains have to be placed over wheels that are located under a truck and fallers have to look up to monitor the crowns of trees. In other situations, the complexity of the tool makes redesign to accommodate different body sizes so expensive as to be prohibitive. Even with adjustable seats, some people fit into the cab of a harvester or truck better than others. And in many cases, changing

the tool to reduce the forces exerted on one joint or body part, only shifts the force to another, sometimes even more vulnerable body part. D-handle shovels place more strain on the forearm, while staff handled shovels can result in elbow or shoulder issues. In a recent analysis of over 24 high-quality, randomized controlled trials that compared MSI during ergonomic interventions with conventional conditions, it was disappointing to see that less than half the studies actually showed statistically significant reductions in pain with the ergonomic intervention (3). Ergonomics were more effective in studies that looked at upper and lower back pain as well as treatments for ankles, wrists, and neck, while those that examined work tasks that loaded the thighs, arms, knees, shoulders, and elbows did not result in effective reductions in MSI. Furthermore, even when the intervention was successful in lowering pain levels, it did not always lead to better function (the ability to do mental or physical work). The authors attributed this finding to the fact that just changing the alignment of a joint did not increase the character of a person's muscle strength and endurance, which were required for improved function (3).

The difference in the outcomes of pain reduction compared to function with the use of ergonomic modifications might be explained by looking at the

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broader definition of ergonomics that includes characteristics like physiology (1). Physiological measures include things like the level of muscle strength, how long a person can sustain a given level of work, range of motion and postural control. These characteristics are very important because ultimately, work has to get done, and stronger muscles with higher endurance capacity and better joint alignment will ultimately allow more work to be performed before fatigue sets in. There are so many external factors that affect work that are outside of a person's direct control, it is even more important to recognize that these aspects of functionality can be significantly improved by addressing physical fitness and rehabilitation of previous injuries. Although it can be hard to find the time and energy to maintain physical fitness, it is the one proven treatment that we know improves mental and physical function. Furthermore, physical fitness not only helps one's function at work, it also leads to better health outcomes and increases one's ability to enjoy leisure activities.

The broader scope of ergonomics also includes factors like noise, vibration and environmental temperature, some of which are easier to address than others. Vast improvements in hearing protection have been effective in reducing hearing damage, while environmental temperature and vibration are harder to address. Improvements in both cold and warm weather cab/building heating and cooling systems and outdoor clothing can help, but here in British Columbia there are extremes of temperature that add significant physiological demand to outdoor work. It takes a lot of energy to stay warm in cold temperatures and cool the body in the heat! The impact of weather also makes some work much more treacherous due to slippery surfaces. Recent research into the use of different composites in the handles of power tools may finally provide real relief from vibration exposure and even adjustments to work/rest schedules fall into the broader definition of ergonomics.

What is clear about ergonomics in Forestry is that we have come a long way. Compared to even 10 years ago, Forestry is a safer and more worker centered industry. We understand that it's the people and how they approach work that are key to safety. In other words, it's the human factors, which by the definition of the IEA is ergonomics. But incidents and injuries do still happen, and we still need more information to fully understand what makes an intervention effective. It's interesting that as an industry only just over 100 articles about ergonomics in Forestry have been published in quality scientific journals over the ten years between 2014 and 2023 (4). That's not very many, especially when you consider how important the industry is in British Columbia. Three of those publications were from Canadian scientists, and they were all interventional studies where a change in how work is performed was compared to the usual way of doing things. Harvesting operations were the most often looked at, followed by wood extraction and pre-harvesting operations, with these three areas making up about 85% of all records. Broken down by tools and machines, the most frequently studied by far were

chainsaw (37), then skidder (17), pre-harvesting tools (16), harvester (14), and forwarder (12).

In spite of the development of new technologies and practices, forestry as an industry remains labour intensive and the risk of MSI and the life-long consequences of these and noise and vibration injuries remains high. A better understanding of how we move and interact with our environment can only help us address the source of these risks and lead us toward solutions, including helping forestry workers build healthy lifestyles with access to healthy food and the time and energy to maintain strong and healthy bodies. Ergonomics is an applied science that can help us study the existing practices, identify problems and test potential solutions that are realistic. That seems like something worth looking into.

Resources:

[What Is Ergonomics](#)

[The Fundamentals - Ergonomics](#)

[Ergonomic Interventions on Work-related MSIs](#)

[Forestry Ergonomics Publications](#) 

