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CLINICAL BULLETIN

Hand Ergonomics

Hand fatigue is a serious workplace issue and can be attributed to many factors besides instrument design. The tasks that healthcare workers (HCW) perform can often be tedious and repetitive. The work is demanding and can cause strain to muscles, nerves, and tendons in their hands, wrists and arms. Additionally, when a HCW wears a glove that restricts movement, he or she must exert more muscle effort to perform tasks, thereby increasing the risk of strain which can lead to hand fatigue and carpal tunnel syndrome.

Ergonomics refers to the interaction between a human's musculoskeletal system and his or her workspace. It can be defined simply as the study of work.[1] Various job functions expose workers to risk factors for musculoskeletal disorders (MSDs), such as those conducted at awkward angles or overhead, involving pushing and pulling heavy objects or performed repetitively. For dental professionals dealing with long days, awkward and prolonged standing and work stations that are difficult to navigate are reported ergonomic challenges.[2] With increased knowledge of ergonomic best practices, personal protective equipment manufacturers are able to develop products that help protect workers from the risk of MSDs and injury.

When considering the role of ergonomics in hand and glove use, four main muscle groups are involved. The two primary muscle groups required for hand and finger exertions include the powerful forearm flexor muscles, located at the top of the forearm, and the extensor muscles[3], located in the back of the forearm.

When workers carry out demanding, tedious or repetitive job functions, the muscles, nerves and tendons in their hands, wrists and arms are susceptible to strain. Such strain can result from either bare-handed or gloved operations, but can be exacerbated by glove use when the gloves are thick, rigid, slippery, ill-fitting or otherwise uncomfortable. In fact, this increase in muscle exertion can also increase the risk of strain. First and foremost, a protective glove style should be selected based on hazard type and functions being performed. Then, selection may vary based on many factors. It is vital that the glove design process includes an assessment of their effect on manual performance to ensure that practitioners can operate safely and efficiently.[4] Selecting high-performing, single-use gloves with a certified ergonomic design is a trusted method for reducing muscle effort and supporting occupational hand health and productivity.

New technology has been developed to provide hand protection that supports musculoskeletal health during repetitive tasks and improves worker performance. An ergonomically designed disposable glove takes into account the toll of occupational activities and applies cutting-edge technologies to engineer solutions that maximize the dexterity, comfort and fit of single-use gloves. Over time, the use of an ergonomically designed glove may lead to less downtime and fewer injuries, thereby allowing for more consistent levels of quality and productivity.

The strength of a single-use glove is of utmost importance to maintaining its protective qualities. However, strength alone can actually work against the ergonomic properties of a glove. Elasticity and modulus are measurements of the glove's ability to stretch and how likely it is to return to its original shape. Taken together, these metrics, as part of a larger equation of overall comfort, help us understand and quantify the softness and comfort level of a glove film. A stiffer glove requires more muscle effort to conduct tasks thereby increasing musculoskeletal pressure, stress and risk of injury. When selecting single-use gloves, look for those

that deliver a high level of glove strength, but are constructed of highly pliant materials to ensure both protection and comfort.

A glove that is carefully designed to deliver optimum fit ensures superior comfort and maximum range of motion. At the same time, the amount of grip a glove delivers plays a major role in the amount of muscle effort required to securely handle, hold or manipulate objects. Ultimately, innovations in formulation, material type, and texture all contribute to a softer, more comfortable, better fitting and better gripping glove that supports the muscles and the worker alike.[5]

With ergonomic design technology, exertion measurements and comparisons are based on specific tasks, such as flexion (opening and closing the hand), pinch grasp (holding a common instrument) or grip friction (completion of a standard precision task). Measurements are evaluated in two ways. The first is by conducting controlled user surveys evaluating comfort and user experience, both before and after tasks are conducted. Survey criteria may include performance, fit, comfort, tactile sensitivity, ability to appropriately don the glove and gripping ability.

The second is by taking electromyography measurements, which quantify the amount of muscle effort exerted by individual muscles in the hand during assigned tasks. Once measurement data is collected, it can be analyzed to determine how glove performance compares to data collected in bare-hand operations as well as those taken during the wear of comparable products. Based on those findings, manufacturers can design products that deliver measurable improvements in user comfort, fit and productivity while reducing the risk factors associated with ergonomic injury.

Conclusion

Healthcare providers no longer have to decide between comfort or protection when choosing a glove. New glove technology is available that provides for appropriate hand barrier protection without sacrificing the much needed support for hand musculoskeletal health. HCWs rely heavily on their hands to conduct tasks of all kinds in their work environment, but long-term strain and muscle exertion are recognized risk factors that lead to various MSDs and injuries in nearly every occupation. When employers supply HCWs with ergonomically-designed, single-use gloves, they can minimize the risk of injury, support compliance, improve worker safety and increase productivity.

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