

## Grip related upper extremity cumulative trauma: New information

While debate continues about whether repetitive strain injuries are caused by work related stressors or pre-existing conditions (personal risk factors), carpal tunnel syndrome, tendinitis and epicondylitis continue to consume dollars and time while causing severe distress to workers. Whether this is caused by early reporting, availability of treatment, the fact that an upper extremity injury is “compensable,” or an increase in work-related stressors is unknown. Regardless, there is a problem with workers lost to reported cumulative trauma.

Despite ergonomics and ergonomic policy (such as the former OSHA Guidelines for Meatpackers) the industry and medical communities continue to seek additional solutions to upper extremity cumulative trauma. Rather than lay blame on the workers, industry or “the system,” one might look for better prevention methods. Providing options that match physical worker capabilities and physical job demands is the cornerstone of work injury prevention. Since low capabilities can lead to fatigue and cumulative trauma, one can assess both individual risk factors and individual work requirements. Individual workers who have the physical capability to perform repetitive work is one goal of the injury prevention system.

A recent study has been published which is a logical extension of what we already know about physical function and ergonomics. It also presents new information for prevention of cumulative trauma in industry.

Many prevention techniques involve education, ergonomics tools, ergonomic work methods and medical prework screening. Much current prework screening is focused on risk factors (nerve conduction, provocative tests) and simple measurements of capacity such as isometric grip strength.

The missing link is information on the ability for a worker to do repetitive activity. Because cumulative trauma disorders are cumulative, 1) weakness or lack of endurance may well create susceptibility to overuse, and 2) fatigue creates a lack of coordination that can

put joints or activities in non-neutral or non-functional positions, the ability to identify the sustained endurance of upper extremities is important.

Maximal handgrip and maximal pinch grip are two of the primary physical tests done. There is physiological evidence the maximum grip is related to endurance activities. While there is a relationship of percent of maximum capability to sustained work, this presumes that for each individual, endurance and strength are related in the same way. Because we know there is individual susceptibility to cumulative traumas, it is likely that there may be individual inability to sustain endurance activities. Also, because repetitive strain prevention will never be harmed by “more fit” workers, an article that has recently been published should receive important attention.

In “Effects of repetitive hand grip training on endurance, specificity, and cross education,” researchers Shield, Leo, Messaros and Sommers [?], measured a component of handgrip activity beyond the common isometric maximum and the less common endurance time. They focused on the ability of subjects to do submaximal rhythmic handgrip. They utilized training in submaximal rhythmic activity at 30% of maximum voluntary isometric capacity. Exercise was dynamic, 5 days per week for six weeks. Results showed an increase in rhythmic handgrip endurance up to 1,232%. This significant increase demonstrates how a low-tech program can be effective in increasing ability to work in manual handling tasks. Another interesting outcome of the article was that the non-trained hand also increased in rhythmic activity up to 43% even though it had not undergone training itself. This also strengthens the concept of conditioning bilaterally.

The emphasis on rhythmic handgrip activity is very useful for practitioners of the ergonomic, “match the worker and the work” philosophy. The exercise positions and methods from the study need to be developed into patterns that can be replicated in the clinic or the worksite. They would require additional validation. Two areas that could be developed are:

- Adding rhythmic handgrip testing to prework screening. This could give greater information than maximal handgrip or nerve conduction studies. A rhythmic handgrip endurance test can be used as a baseline. We should be able to understand, after outcome studies are performed, whether the ability in this activity is a protective factor for workers entering into a job.
- Because conditioning could also be protective in those entering into new work, the application of a conditioning program could be implemented. The ability for the worker to improve their rhythmic endurance activity could coincide with on-the-job training and orientation to productive work in handwork activities.

Ergonomics facilitates the match of work and worker. If forces required to do a job can ergonomically be reduced, it may have a positive effect on productivity and also reduce the incidence of reported illness/injury in the upper extremities. The additional concept of improving the strength and endurance of the worker also affords an ergonomic solution as it allows the work-

er's body to be more effective in work activity. As the worker is more able to counteract fatigue and loss of coordination, the ability to maintain work techniques is improved.

Adding this concept to our armament of ergonomic solutions will strengthen the ability of the worker to productively and safely do work and maximize the employer's investment in a productive, safe worker.

### Reference

- [1] Shields, Leo, Messaros and Sommers, Effects of repetitive hand grip training on endurance, specificity and cross education, *Physical Therapy* **79**(5) (1999), 467–475.

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