Is Stretching a Good Strategy to Lower the Risk of WMSDs?

A White Paper by Humantech, Inc.
February, 2012
# Contents

*Introduction* .................................................................................................... 1

The physiology of stretching ....................................................................... 1

What are some benefits of stretching? ....................................................... 1

Can stretching improve human performance? .......................................... 2

Can stretching reduce WMSDs? ................................................................. 2

What is the cost of a stretching program? .................................................. 3

What should companies focus on? ............................................................... 4

References ..................................................................................................... 5

About Humantech.......................................................................................... 6
Introduction

People are the sole source of productivity in any company. It is important to understand how to leverage these resources to perform at their best. Some organizations are pursuing or considering stretching programs as a means of increasing the worker's performance. While many companies advocate for stretching programs before and during the workday, the research on the topic indicates, at best, mixed results. One shortcoming of the research is that many of the studies on the effectiveness of stretching programs rely on subjective rather than objective measurements. Demonstrating an improvement in self-ratings of an overall feeling of well-being does not address the impact on human performance or injury reduction. Even some of the objective measures used do not translate into an impact on the job. For instance, demonstrating that a workplace stretching program improved range of motion among participants does not indicate that the program was effective in meeting its primary goals. The real question that needs to be answered is whether the stretching program contributes to a reduction in injury rates.

There are several significant issues to consider with regard to stretching programs. First, these programs do not identify or fix the root cause of the problem and, in some cases, may do more harm than good. Second, the cost of these programs can be fairly significant. It is important to consider the total amount of time away from job tasks that must be spent in order to properly and effectively stretch; this is lost production time. And finally, the resources invested in stretching programs could be more effectively utilized to improve the job.

The physiology of stretching

Flexibility is defined as the range of movement around a person's joint. It refers to the changes in the length of muscle and tendon unit as a result of changes of the properties of the unit itself. Stretching will cause a change to the length of the muscle tendon unit over time. As a result, it changes the amount of force production and range of motion at that particular joint. This will affect the distance the muscle can stretch and the amount of force required to tear the tissue. The assumption is that stretching will increase the length of the muscles, resulting in more flexibility and a decreased risk of musculoskeletal injuries. This paper will investigate that assumption by reviewing the available research on this topic.

What are some benefits of stretching?

Stretching can provide employees with several benefits, and may be helpful from a morale and team cohesiveness standpoint. Employees may experience greater flexibility, as well as enhanced perceptions of their body attractiveness and physical fitness (Henning, et al., 1997). Another benefit of stretching is that subjects may increase their range of motion compared to their counterparts who do not participate in stretching programs (Hartig and Henderson, 1999). Employees have also reported lower levels of stress, stiffness, and muscle aches while working at a computer workstation (Viera and Bruno, 1998).
Can stretching improve human performance?

Stretching has been a mainstay activity in sports and exercise, but a growing body of evidence is calling the conventional wisdom of pre-game stretching into question. Research has shown:

- Static stretching prior to an athletic event will reduce muscular power (Marek, S.M., et al., 2005), torque (Evetovich, T.K., et al., 2003), maximum force output (Bacurau, R.F., et al., 2009), vertical jump height (Young, W. and Elliott, S., 2001), sprint speed (Nelson, A.G., et al., 2005), agility (McMillian, D.J., et al., 2006), and maximal strength for up to 1 hour (Fowles, J.R., Sale, D.G., and MacDougall, J.D., 2000).

- Static stretching prior to an athletic event will lower endurance and performance, and increase the energy cost of running during a 30-minute run (Wilson, J.M., 2010).

Based on this information, it appears that a general warm-up activity before work would have more potential benefits than pre-shift stretching, although it should be noted that the relationship between maximal exertion and WMSD prevention is not well established. It should also be noted that there can be physiological differences between athletes and industrial workers. Also, intensity, repetition and duration of physical exertion vary between these two populations, and therefore findings of effectiveness of stretching should be interpreted carefully.

Can stretching reduce WMSDs?

Musculoskeletal disorders are injuries that usually occur at joints in the body. They include injuries or dysfunctions involving muscles, bones, nerves, tendons, ligaments, joints, cartilage, and spinal discs. WMSDs can occur as a result of overexertion and cumulative load on the body. Proponents of stretching speculate that it could affect the risk of developing a WMSD by changing the properties of the ligament muscle unit.

Little is known about specific outcomes of workplace stretching programs, but there have been several research articles that investigate their effectiveness. The evidence seems to be inconclusive at best. Viera and Bruno (2008) conducted a review of seven articles that measured the ability of a stretching program to prevent WMSDs. The articles looked at workplace stretching programs across several industries ranging from computer work to heavy work, such as that performed by firefighters. None of the articles reviewed showed a statistically significant decrease in WMSDs.

Researchers have expressed concern that while muscle lengthening may be beneficial for some individuals, stretching may be harmful for those experiencing WMSD symptoms. The article “A Review of physical exercises recommended for VDT operators” (Lee K., et al., Applied Ergonomics Vol 23(6), 1992), identified that 90% of common office ergonomics stretching exercises (127 were included in the study) could aggravate pre-existing conditions. 100% of the exercises for the elbow/lower arm and lower back/hip were found to create a potential for harm to the user. This was also true for 93% of exercises for the shoulder, 82% for the knee/lower leg, and 72% for the neck.
There are several questions that should be answered when considering a stretching program to ensure its effectiveness:

- Is stretching beneficial only to those who are not already flexible?
- Is stretching effective for all joints?
- Is there an ideal time of the shift to perform stretching exercises?
- How often should employees stretch?
- Are all stretches equally effective?
- Should people who perform different jobs do similar stretching exercises?

Unfortunately, the answers to these questions will vary greatly from industry to industry and from task to task.

What is the cost of a stretching program?

Many health and safety professionals underestimate the cost of a workplace stretching program. Here is a simple way to evaluate it.

**Step 1: Calculate the recommended workplace stretching activity time (in minutes) per week (Equation 1), based on the following guidelines recommended by the American College of Sports Medicine:**

- Warm up for 5 minutes, minimum, prior to stretching
- Tailor exercises to commonly performed job duties
- Stretch regularly, minimum 2 to 3 days per week
- Perform stretches correctly:
  - Use static or PNF (proprioceptive neuromuscular facilitation) stretches
  - Hold stretches 10 to 30 seconds
  - Repeat 3 to 4 times per muscle group
  - Stretch bilaterally, emphasizing tight muscles
  - Stretch to mild level of discomfort only
- Have only trained instructors lead or monitor classes
- Monitor compliance
- Stretch at the appropriate work times throughout the day

\[
\text{Recommended workplace stretching activity time per week (minutes) } = (\text{Warm-up time} + (\text{number of muscle groups} \times \text{duration of stretch}) \times \text{repetitions per muscle group}) \times (\text{number of times per week})
\]

Using this value, it is possible to calculate dollars spent weekly and annually for an in-house stretching program.
Step 2: Calculate potential for lost revenue (in dollars) if production is discontinued during the stretching activities.

\[
\text{Lost revenue (dollars)} = \text{Recommended workplace stretching activity time per year (hours)} \\
x \text{number of workplace employees} \\
x \text{production per hour (unit/hour)} \\
x \text{revenue per unit}
\]

Step 3: Calculate the potential for lost profit.

\[
\text{Lost profit (in dollars)} = \text{Lost revenue} \times \text{profit margin}
\]

Stretching programs add a large non-value-added cost, with results that are not yet proven to be successful. In contrast, engineering controls have consistently delivered successful results when applied to reducing WMSDs. With limited resources available to invest in the prevention of WMSDs, it makes sense to pursue proven methods. Research by Goggins, Spielholz, and Nothstein (2008) showed that engineering controls were much more effective than controls that rely on behaviors in reducing WMSDs numbers, incidence rates, lost work days, and worker’s compensation costs.

What should companies focus on?

One author suggests that stretching should not be used independently to reduce the risk of WMSD. It is important to note that the goal of ergonomics is to match the job task demands to the capabilities of humans, and therefore stretching does not necessarily fall into this category. In other words, the focus should be on changing the task demands so employees are more able to work effectively. The focus should not be on the adaptation of the human to the work itself. Stretching is not ergonomics, but may compliment good engineering solutions to existing problems.

Stretching has not been demonstrated to improve human performance nor reduce WMSDs, but even if new evidence later indicates that stretches may help alleviate the problem, stretching does not address the root cause of the risk itself. If a stretching program is implemented, it should be only part of the solution. More effort should be focused on identifying and eliminating the root cause of the risk.

If the task demands and the work environment are designed to accommodate our biological capacity, the human will achieve optimal human productivity and minimum error. On the other hand, if the task demands require a person to operate continuously outside of his or her capacity, the human will perform the work unreliably and may eventually break down. If we keep this in mind as we look at how humans interact with their work, it is easy to see that the workplace must be designed for human capability.
References


About Humantech

For over 30 years, global companies have relied on Humantech for workplace improvements. By combining the science of ergonomics and our unique 30-Inch View®—where people, work, and environment intersect—we deliver practical solutions that impact safety, quality, and productivity. At Humantech, we know people make productivity happen.

Our clients look to us for the tools and knowledge necessary to create a bridge between humans and their work environments. By furthering an understanding of the capabilities and limitations that people have, Humantech strives to improve the safety and productivity of workers in all environments while, at the same time, enabling these workers to produce the highest quality products and services.

Companies that make the move from a reactive approach to injuries to a proactive and/or advanced approach to workplace design, find that ergonomics is central to executing at the highest levels. Humantech helps companies identify and quantify injury risk in the workplace, provides training and consulting aimed at removing that risk, and delivers management systems that embed these processes into a corporate culture.

To learn more about how Humantech can optimize the capabilities of your workforce, please contact us:

Humantech Corporate Office
1161 Oak Valley Drive
Ann Arbor, Michigan  48108
Tel.  734-663-6707
Fax. 734-663-7747
www.humantech.com