

## **“Is Your Stretch & Flex Program Cutting Edge?”**

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### **Introduction**

Many “Stretch & Flex” programs are conducted in industry and construction around the country and have been out there in many forms, created by people with all kinds of varied backgrounds, and for many years. Some float around on the internet for free or get passed down from year to year or company to company. Many companies report a resulting reduction in workers compensation claims. Is this because of the science, content, and methodology or is it because of improved employee morale or is it both?

It is fairly well known in the safety profession that high morale among employees leads to fewer injury claims. When a company offers a “Stretch & Flex” program, employees tend to believe their employer cares about their well being. As a result, there is often increased team work, accountability, and responsibility. This type of domino effect alone could cause a reduction in injuries and claims.

Stretching research indicates what should and should not be included in “Stretch & Flex” programs, yet the research has not been applied to improve “Stretch & Flex” programs. The research leads me to conclude that typical “Stretch & Flex” programs that do succeed with injury frequency reduction are succeeding **DESPITE** the science, most likely due to the powerful intervention of improved morale – a legitimate intervention in and of itself. And, in fact, the science may surprise you because it indicates that most of these programs are actually designed against clinical recommendations.

I will propose in this paper that we must apply information from stretching research to “Stretch & Flex” programs and that doing so will make these programs cutting edge, and will likely generate even better injury prevention results.

### **Typical Stretching**

Many people believe there is basically one way to stretch. However, there are different methods of stretching and different lengths of holding stretches that serve different purposes.

- Static Stretch -- Hold muscles/tendons in a still position for 15-45 seconds (most often 30 seconds). The typical “Stretch & Flex” program uses a static stretching method where muscle/tendon groups are stretched for 15 – 30 second holds before a shift.

- Dynamic Stretch -- Large active movements to bring joints to their full range of motion (AROM) which facilitates neuromuscular coordination. This uses the body's natural reflexes to stretch one muscle group while the opposite muscle group is contracting.
- PNF Assisted / Contract Relax Stretch -- An alternating 'contract-relax + hold' pattern for different muscle groups, with the contraction most often being 2 seconds and the hold most often being 8 seconds. This is often done with a trainer or therapist moving the joints.
- Ballistic Stretch -- Repeated bouncing movements at the end of the active range of motion of joints. This triggers the stretch reflex which encourages muscle contraction rather than relaxation and lengthening.

The common beliefs of the benefits of stretching are to: Reduce Injury Risk; Enhance Performance; Prepare for Activity; Accelerate Healing; Reduce pain after exercise (DOMS); and Reduce pain with Joint Stiffness. Those first two – reduce injury risk and enhance performance – are generally the driving beliefs behind workplace “Stretch & Flex” programs. However, let's examine the science and see if these beliefs match that science.

## Stretching Research

There is some workplace research looking at post-activity stretching, or stretching throughout the work day, as an ergonomic intervention to mitigate the physiological changes associated with repetitive or fatiguing tasks.

Stephen Pheasant<sup>1</sup> describes the effectiveness of historical Scandinavian pausgymnastik which is just as it sounds – taking brief and active breaks during a work shift. He writes that frequent short rest pauses during the work day are better than occasional long ones. He also cites research on chain gangs and heavy manual laborers from the 1930's in the Soviet Union & Germany that showed that mental activity or light physical activity during brief rest breaks aids in the recovery from muscle fatigue, even for heavy manual work.

Saunders<sup>2</sup> also cites several studies showing that gentle stretching during brief breaks throughout the work day increases blood flow and alertness better than passive breaks (i.e. sitting).

But, “Stretch & Flex” programs are typically at the start of a work day. So, the above findings cannot really be used to understand the benefits or lack thereof when it comes to “Stretch & Flex” programs. In fact, there is very poor research related to pre-activity stretching in the workplace, primarily because workplaces and employees and stretching programs vary so much, and because different metrics are measured. It becomes very difficult to conclude anything about workplace stretching programs. In fact, Hess & Hecker<sup>3</sup> conducted a literature review and determined that the effectiveness of workplace stretching programs is inconclusive.

Since the entire premise of workplace “Stretch & Flex” programs is that they will reduce injuries and improve performance, we must turn to sports research to examine the effect of pre-activity stretching on injury rates and performance. It is my opinion that we can apply this sports research to workplace “Stretch & Flex” programs because these programs are typically done before work activity, i.e. pre-activity stretching. In fact, the term “Industrial Athlete” is commonly used in industrial rehabilitation research.

A 2004 literature review of 361 articles world wide<sup>4</sup> resulted in the finding that static stretching prior to physical activity results in no significant injury reduction, and furthermore that

static stretching prior to physical activity can cause the following negative effects after the stretching bout:

- Increased blood pressure
- Reduced strength
- Reduced running economy & endurance
- Reduced running speed
- Reduced jump performance
- Reduced balance
- Reduced reaction time

Some of the specific studies reviewed include many showing no effect and many showing a negative effect. In one randomized 12-week study of 1,538 male army recruits<sup>5</sup>, both the stretch group and the control group warmed up for 5 minutes prior to physical activity. The stretch group did 20-second static stretches of the gastrocnemius, soleus, hamstring, quadricep, hip adductor, and hip flexor muscles/tendons after the warm up and prior to the physical activity. The injury rate in the stretch group was 21.5% compared to the control group's 21.8% injury rate, so pre-activity stretching had no effect on injury reduction.

In a randomized 16-week Dutch study of 421 recreational runners<sup>6</sup>, they compared a stretch group with a non-stretch group. Like the study above, both groups warmed up. They found that a warm up plus stretching prior to running had no effect on injury risk: there were 5.5 injuries/1,000 hours of running in the stretch group; 4.9 in the control group.

In a study of Australian Rules Football athletes<sup>7</sup>, they compared performance between one group who did a dynamic warm-up followed by static stretching and the other group that did only a dynamic warm-up prior to performing maximum kicks. There were no statistically significant differences in kick performance between groups, so pre-activity stretching did not improve performance.

Many studies show a negative effect of static stretching prior to physical activity.

A study of 30 university participants measured strength after static stretching<sup>8</sup>. 15-second static stretches of the hip, thigh, and calf (5 muscle groups total) were followed by a 1-rep maximum knee extension and knee flexion test. They found that static stretching decreased knee flexion strength by 7.3% and knee extension strength by 8.1%.

Another study found decreased force production and muscle activation in quadriceps muscles after static stretching.<sup>9</sup> Another study found that static stretching is associated with significant reduction in muscle strength endurance.<sup>10</sup>

Dr. O'Donovan<sup>11</sup> cites negative study after study, with the following findings:

- 28% reduced calf strength immediately after stretching with significantly reduced strength that remains even one hour later
- 12% reduced quadriceps (thigh) power up to 2 hours after static stretching
- Slower sprints after 30-sec static stretch of hams, quads, calves
- Reduced balance and reaction times after static stretching
- Best running economy is in the least flexible people

In fact, one study found 20 meter sprint performance improved after dynamic warm-up and worsened after static stretching warm-up for ruby union players in Australia.<sup>12</sup>

Fyfe<sup>14</sup> sums it up nicely, “static stretching should not be included in warm-ups, as it seems to decrease performance of explosive actions and activities demanding muscle strength endurance,” (p.5).

## **Bottom Line on Static Stretching**

The research is so compelling that in 2004, the American College of Sports Medicine (ACSM) changed their official position to recommend no static stretching prior to activity! Instead, they recommend dynamic stretching warm-ups (large body motions) prior to activity and static stretching afterward.

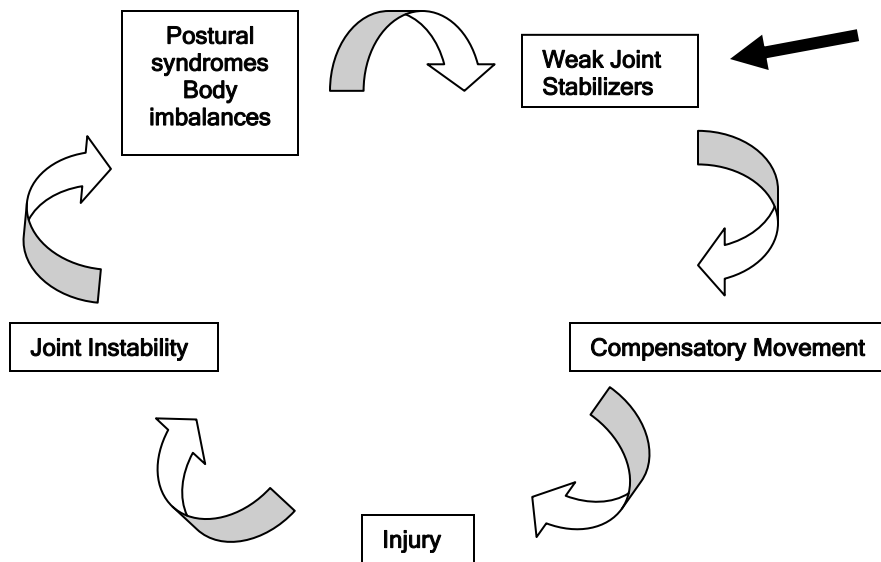
Combining research from both the sports world and the ergonomics world, my workplace stretching recommendations are to do 8-10 second static stretches throughout the work day, 2-5 days per week, in the opposite of work positions or in ways that stretch the muscles/tendons that have just been used. These stretches should only be mildly uncomfortable and tailored to match the physical demands of work. Customizing stretches to the individual worker would be even better, as this could help address underlying postural, joint, or movement dysfunctions (e.g. hyperlax ligaments may be associated with injury and pain may be underlying cause of joint injury<sup>13</sup>). It is my belief that this method of stretching flushes out the chemical build up in tissue that results from static or repetitive contractions by activating the muscle pump, and therefore prevents the onset of pain.

## **So, What SHOULD You Do Instead? Dynamic Warm Up with Joint Stabilization**

As an occupational therapist and a fitness trainer, I know that.... [please refer to Exhibit 1]

- Postural syndromes and body imbalances typically lead to weak joint stabilizers
- And these weak joint stabilizers typically lead to compensatory movement patterns (people moving any way they can, using the wrong muscle groups or the wrong sequence of contraction)
- And these compensatory movement patterns typically wear down the tissues surrounding joints and cause injury
- And an injury often leads to further joint instability.....

It is a “chicken or egg” scenario and a vicious cycle that must be interrupted. It is my opinion that a dynamic warm up program that also focuses on joint stabilization can help interrupt the cycle by addressing weak joint stabilizers [dark arrow Exhibit 1].



### Exhibit 1: Injury Cycle

Aside from being recommended by the ACSM, the benefits of dynamic stretching warm ups prior to activity are that they lubricate joints, increase blood flow to the extremities, and prepare the mind and body for work (neuromuscular coordination, and a ‘check-in’ opportunity with your body).

The benefits of adding joint stabilization techniques to this are that they increase the strength and stability of joint structures over time which likely results in reduced strain / sprain, tendonitis, rotator cuff tear, and other common soft tissue injury frequency and severity.

In a pilot study of our version of this type of warm up program for a construction company, we found that out of 9 participants, 100% reported less pain in one or more body parts after doing the mandated program at the start of the shift for 3 months. Of the 9 participants, 4 of them scored normal range of motion at baseline so were unable to show improvements during outcome measures; but of the other 5 participants, 4 participants showed improved range of motion in a total of 20 body parts. The outcomes were measured using a symptom survey and a goniometer for joint range of motion 3 months after the program was instructed to the employees.

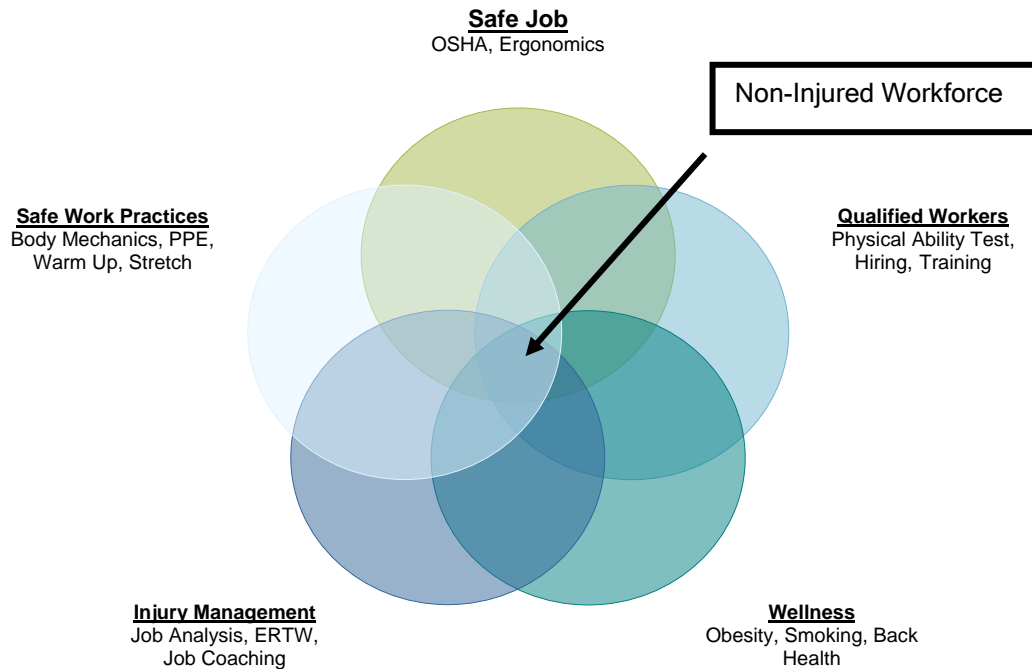
### Recommendations for a Truly Cutting Edge Program

To truly be cutting edge, offer BOTH a dynamic warm up program (preferably including joint stabilization) and a stretching program. Specifically, I would recommend you do a dynamic joint stabilization program BEFORE the shift INSTEAD of stretching! This lubricates the joints, prepares the mind, gives people a chance to check in with their body, increases blood flow to the extremities, and increases the strength and stability of joint structures to prevent strain and sprain!

I would also recommend you do 8-10 second static stretches that are appropriate for the work tasks being performed. Do these throughout the day, not at the start of the shift. For more permanent and significant changes for individuals, provide individual customized stretch and stability programs that accommodate for prior injuries and that they can do after work.

Additional necessary measures to ensure success:

- Ensure you have company commitment to pay employees to perform the movements in these programs and to pay for program overhead.
- Make sure you use very qualified instructors (e.g. therapists) to design & monitor your program so that employees avoid compensatory patterns and so that individual custom modification of a movement can be instructed to accommodate people's limitations as needed.
- Ideally, programs would be re-instructed periodically over time, and new ones introduced every now and then, to ensure employees perform movements appropriately and to prevent boredom.
- Like all good safety programs, compliance should be monitored.
- And finally, incorporate all the elements that contribute to an injury-free workforce, as indicated in Exhibit 2 below, not just warm up and stretching.



**Exhibit 2. Integrated elements required to create an injury-free workforce.**

In summary, stretching does not strengthen deep joint stabilizers. Strengthening deep stabilizers does not stretch tight prime muscles. Doing both – dynamically - is the ultimate cutting edge type of pre-activity warm up workplace program to have! Hopefully, these principles will create new-and-improved “Stretch & Flex” programs around the world.

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