

## **Work Site Stretching Programs: Five Key Processes for Continuous Improvement**

**Fred Drennan, President  
Team Safety, Inc.  
Ojai, California**

### **Introduction**

Lack of physical fitness (in particular muscle imbalance and inflexibility) is a primary risk factor for musculoskeletal disorders (MSDs) (Whiting & Zernicke, 1998) and is increasingly being addressed by worksite stretching programs. These programs can take many forms, from “canned” programs using posters and videos, to computer based programs and “apps” that prompt workers to perform a series of stretches. Some employers have developed custom programs using physical therapists to design stretches specific to the worksite. However, these programs will not survive on their own, no matter how well designed, unless they are integrated into the management process in the same way as quality or productivity.

To be successful in building a fit workforce, many factors should be considered. At a minimum they include management commitment, supervisor training, team building, improving the psychosocial climate, recognition and rewards, and a solid accountability system (Drennan, Richey, 2012), as well as a well-designed strength and flexibility exercise (SAFE) program. This article focuses on five processes identified as essential for program success based on 15 years’ experience deploying SAFE programs in diverse industrial settings. Without these essential processes, a SAFE program will sit on the sidelines, lose momentum, and fail to produce the desired result: a healthier, safer, and more productive workforce.

The five essential processes to build a fit workforce are:

1. Manage the Process - Measuring Employee Flexibility
2. Provide Feedback with Flexibility Reports for Continuous Improvement
3. Shape Behavior – Becoming Fit with Progressive Exercises
4. Motivate the Workforce – Making Learning and Exercise Fun
5. Audit Frequently to Get Results

## 1. Manage the Process - Measuring Employee Flexibility

Without data you just have an opinion. Effective management requires effective measurement. How would you know the current status of productivity, sales, or quality without key performance measures? If you have a stretching program, is employee flexibility improving, staying the same or getting worse? Which supervisor/team has improved the most? Unless you measure employee flexibility, you just have an opinion on the effectiveness of the stretching program.

### Choosing the Right Measures for the SAFE Program

Four components define a person's health-related fitness: muscular strength and endurance, body composition (fat vs. lean), cardio-respiratory endurance, and muscular flexibility (Hoeger & Hoeger, 2011, p.18). In a work setting, assessing three of these areas presents some problems. Muscular strength and endurance measurement involves maximum effort by the participant, which could cause serious injury to the employee if not properly conducted by a skilled person. Cardio-respiratory endurance measurement requires specialized equipment and also poses some risk. It is easy to test body composition; however, only in rare cases, such as in the military or the fire department, can an employer *require* workers maintain a healthy weight (even though obesity is a health hazard of epidemic proportions).

We found conducting muscular flexibility assessments in a variety of industrial settings to be easy and practical. Measuring flexibility is non-invasive and can be done by the safety professional or designee with minimal training using three standardized flexibility tests (Exhibit 1). The equipment is relatively inexpensive and easy to maintain and store.

The top photo in Exhibit 1 shows the Sit and Reach box, which is the most commonly recognized. It measures the flexibility of the lower back and hamstring muscles, which are essential for proper lifting (Exhibit 2). The center photo shows the calibrated stick used to measure Shoulder Rotation. Good shoulder flexibility can reduce injuries to the upper body, (Exhibit 3). Total Body Rotation is easily measured using rulers against a wall, as in the bottom photo. Good trunk rotation allows employees to bend, twist and lift without injury (Exhibit 4).



**Exhibit 1. Muscular flexibility is easy to measure using three common test devices.**



**Exhibit 2. Flexibility of the hamstrings allows or limits an employee's ability to use proper lifting technique.**



**Exhibit 3. Good shoulder flexibility can reduce injuries to the upper body.**



**Exhibit 4. Good trunk rotation is essential to bend and twist without injury while performing everyday tasks.**

Together, these three tests provide a general assessment of a worker's ability to perform everyday movements such as reaching, bending, and turning with a minimum risk of injury (Hoeger & Hoeger, S. 2011, p. 262). By conducting baseline and subsequent tests in these three areas during the course of a SAFE program, the safety professional can determine the effectiveness of the exercise program.

*Problems with the Total Body Rotation Test*

After testing thousands of employees using these devices, we found the Total Body Rotation test had some inherent drawbacks that resulted in wide variation in employee test results. A basic problem was using a linear scale (in inches) to measure rotation instead of the appropriate scale of degrees of angle. The standing position allowed hard to control variables such as excessive bending at the waist and knees, hyper-mobile shoulder joint, and allowed the feet to pivot which also skewed the results (Exhibit 5). It became clear that a more consistent and accurate measure of trunk rotation was needed.



**Exhibit 5. The Total Body Rotation test allowed hard to control variables that produced false reports of high rotation.**

*New test reveals cause of chronic low back pain*

Safety professionals hear it all the time: “I hurt my back when I bent over and twisted.” Back injury prevention training inevitably includes warnings against bending and twisting while lifting. However, it is one of the most common moves we make. Why can some workers bend and twist without injury while others are injured? Does lack of flexibility—in particular, restricted trunk rotation—play a role in acute and chronic low back pain (LBP)? We tested the theory, using a new equipment design that eliminated the influence of excessive bending of the waist and knees, and foot movement. A bevel protractor with a push bar was attached to a chair to measure trunk rotation in degrees of angle as opposed to linear inches (Exhibit 6). In a field study, 240 randomly selected individuals participated in a two-part research design addressing chronic (not acute) LBP.





**Exhibit 6. The TrunkFlex 180° (patent pending) showed a statistically high correlation between restricted trunk rotation and chronic low back pain.**

In the first part, test subjects were interviewed about the frequency and pain intensity of chronic LBP, recorded as: mild, slight, moderate, or severe. The frequency of chronic LBP was recorded as: zero, less than 10%, 11-26%, 51-75%, or 76-100% of the time.

In the second part, test subject trunk rotation was measured using the prototype test chair. Range of motion (ROM), in degrees of angle, was measured for both left and right sides.

Rotation measurements were compiled in two data sets. In the first set, the combined rotation for the left side and right side were averaged. In the second, the difference in rotation between the left side and right side was recorded. Data analysis showed a high statistical significance in the difference in degree of trunk rotation (P-value <.001) between those who reported chronic LBP and those who did not. In addition, within the group reporting chronic LBP, for every 22 degrees of increased total rotation (right side plus left side) reports of chronic LBP decreased by one level of pain intensity. The difference in rotation between the left and right side (some subjects had as much as 30 degrees) barely missed being statistically significant (P-value <.053).

More study is needed to validate a strong correlation between restricted trunk rotation and chronic LBP. However, initial results provide good news for safety professionals: a well-designed worksite SAFE program that fits the general work population, including exercises that focus on rotation of the low back, can show measurable results in reducing chronic LBP.

Using these flexibility assessment tools, the safety professional has the ability to gather solid data on the “fit for duty” of the workforce and design an effective SAFE program that gets measureable results in reducing chronic LBP and other MSDs.

## **2. Provide Feedback with Flexibility Reports for Continuous Improvement**

To maintain high program participation and motivate continuous improvement, individuals and teams need to know how they are doing. Flexibility reports compiled using data collected during testing are an essential feedback tool and are a critical process of the SAFE routine (Exhibit 7).

### FLEXIBILITY ASSESSMENT FOR JANE DOE

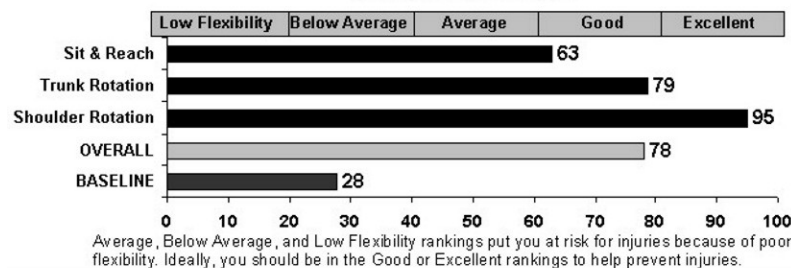
Good flexibility is an important factor in maintaining good health and quality of life. Many musculoskeletal injuries, especially among adults, are related to lack of flexibility. The more flexible you are, the greater your range of motion, and the lower your risk for injury to the low back, shoulders, and other soft tissues. Regular stretching CAN increase your flexibility.

#### FLEXIBILITY MEASUREMENTS

Test Type	Baseline: December 2001	Phase 4 Assessment November 2002
Sit & Reach	14.25	15.5
Trunk Rotation	5	22.5
Shoulder Rotation	28	6

Jane, your flexibility measurements were used to compute a percentile ranking compared to females of 37 years of age. Your OVERALL ranking is an average of three flexibility test scores. Your overall BASELINE score will be displayed for comparison as you go through the program so you can track your improvement.

#### PERCENTILE RANKING



#### Exhibit 7. Software was developed that reports test results by individuals, teams, departments and total organization.

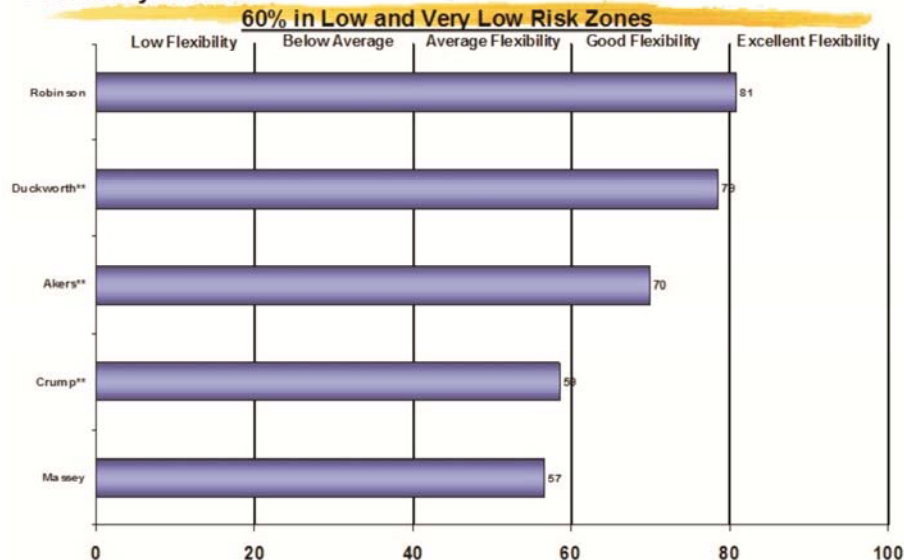
In the first year of implementation, performance feedback should be frequent. We found feedback should be given at least quarterly; any longer and the employees start to lose interest, and participation declines. The quarterly reports also give the program administrator a snapshot of progress and an opportunity to address problems in a timely manner.

The flexibility reports also offer opportunities to give awards and recognition. For example, individuals and teams that have improved the most, or have the highest participation or highest team scores, should be acknowledged for their performance (Exhibit 8). Ball caps and t-shirts are great for this.



## Team: Maintenance Department

### Flexibility Results



**Exhibit 8. Posting team scores promotes friendly competition, motivates continuous improvement, and provides additional opportunities for praise.**

### 3. Shape Behavior – Becoming Fit with Progressive Exercises

To develop new complex behaviors, such as getting fit, it is crucial to start with small steps and progress slowly toward the desired result (Forsyth & Marcus, 2003, p. 26). Many stretching programs never advance beyond pre-work warm-ups. The worksite SAFE program should continually advance, or employee strength and flexibility will adapt to the maximum level necessary to perform an exercise. For example, a group of office workers were limited to performing a set of wrist and finger exercises to lower their risk factors for carpal tunnel syndrome. This was highly commendable. However, when one of the workers was asked to put a case of paper (40 pounds) in the storeroom, he suffered a back injury. This illustrates the importance of providing progressive strength and flexibility exercises that address the total body and not limit them to job tasks.

#### Sustain interest and challenge with quarterly change

Even if the exercises are challenging and fun to begin with, employees will get bored doing the same thing over and over. People who adopt a lifetime of exercise mix up their routine (cross-training) like swimming, biking, or playing tennis. One of the primary goals of a SAFE routine should be to ensure high participation rates. It is important to keep employees interested and challenged so they can continuously improve. We found every three months is when a new routine should be introduced with different moves and increased challenge. Active employees may find a quarterly change schedule slow, while the sedentary group (60% of the American population) may find it too challenging. Strike a balance between the two. Another factor to consider in frequency of change is the impact it has on production schedules. A first-line supervisor may resent the time away from production unless management has established employee physical fitness as a core value and approves the necessary time.

Following is an example of a year-long program using four progressive phases that are fun and challenging. Each phase addresses the entire body: upper region (neck, shoulders, upper back, hands); mid region (trunk or core area); and lower region (hips, hamstrings, knees, calves, ankles). This SAFE routine, when applied as a core process, has proven successful with thousands of employees in promoting interest with continuous improvement in strength and flexibility and overall reductions in MSDs.

**Phase I—Static Stretching:** In this introductory phase employees hold static positions starting with 10 seconds and then build up to 15-20 seconds (Exhibit 9).



**Exhibit 9. A simple static stretch improves basic flexibility, body awareness, builds the employee's self confidence to knock down barriers to participation.**

**Phase II—Functional Stretching:** Static stretches progress into functional movement. For example, instead of holding a static  $\frac{1}{2}$  squat position to teach proper body alignment for lifting, the employees now move up and down to model proper lifting. This phase builds strength and skill to help workers learn proper body mechanics.

**Phase III—Stretching with Fitness Sticks:** In this phase, fitness sticks are added to address chronic neck and shoulder pain (including rotator cuff injuries), which is usually due to poor posture resulting from lack of flexibility in the shoulder girdle (Exhibit 10).



**Exhibit 10.** Fitness sticks add fun and help reduce posture problems such as rounded shoulders and forward head.

**Phase IV—Building Strength with Fitness Cords:** In this phase, resistance cords are added to promote “balanced strength” and counter the effects of repetitive motion found in most tasks. Strength, in particular balanced strength, is a major component to prevent MSDs. (Exhibit 11).



**Exhibit 11.** Resistance cords add challenge and can be used to reinforce proper lifting technique.

## **4. Motivate the Workforce – Making Learning and Exercise Fun**

When exercises are enjoyable and fun, people will be motivated to participate (Forsyth & Marcus, 2003, p. 74). It is important to augment the SAFE program with education. In particular, employees should know that MSDs, such as back and shoulder injuries, are inversely correlated to balanced strength and flexibility (NIOSH, 1998). As an individual's strength and flexibility increases, the risk factors for MSDs decrease. The reverse is also true: As a person loses strength and flexibility, their risk factors for MSDs increase. They also should know that, as we age, we lose strength (Andersson, et. al., 1999) and flexibility (Hoeger & Hoeger, 2011 p. 306), unless we exercise. Employees are more likely to be motivated to participate and improve their strength and flexibility if they understand it will help reduce their risk of MSDs.

Learning how each exercise is relevant to daily activities is also a motivator. Asking employees to perform a half squat may cause some resistance, but doing the exercise correctly is the foundation for proper lifting and preventing lower back injuries. Employees should be constantly reminded how each exercise relates to injury prevention and daily activities such as reaching, pulling, and lifting. The primary objective of a good trainer is to ensure the employees make this connection.

The first 10-15 minutes of each day should be a time when employees look forward to camaraderie and improving their health and safety. Just as Frisbee or basketball can make exercise fun, providing the employees with fitness sticks and cords is an easy way to maintain interest and challenge and should become a core element in the SAFE program.

## **5. Audit Frequently to Get Results**

The role of the safety professional is to audit the status of the SAFE routine. Are the teams starting on time? Are they doing the exercises correctly or are they just going through the motions? Is the supervisor actively participating? And most important, are the employees enjoying themselves? Frequent auditing by the safety professional keeps everyone on track and provides middle and senior management with objective measures to judge supervisor/team performance.

Vital to the audit is a well designed audit sheet (Drennan & Richey, 2006). It should prompt the auditor to ensure participants are getting the benefit of using proper overall technique, proper timing, and that the supervisor is getting full participation from his group. The supervisor/team should be scored at least monthly and no longer than two weeks after a new routine is introduced. The audit sheet provides the safety professional with a tool to conduct performance dialogs with the team and supervisors. In a fully integrated program (Drennan & Richey, 2012) the audits are the tool to measure the supervisor's safety performance and become part of the annual review.

## **Summary**

If all the efforts of public health organizations, wellness programs, and the media to educate the people about the dangers of obesity and lack of exercise were successful, Americans would all be thin nonsmokers running marathons (Lipman, 2012). But this is very obviously not the case. It is estimated that over 75 percent of the entire national health care system is driven by unhealthy lifestyles (CDC, 2009). The impact on injuries and workers compensation is unknown.

Working in various industries, we identified five essential processes necessary to effectively drive a SAFE program to improve worker fitness. Measuring employee flexibility (a risk factor

for MSDs) is easy and widely accepted by the employees. Feedback, essential for learning and continuous improvement, can be delivered via flexibility reports. Attaining a sound level of physical fitness cannot be achieved overnight; most employees will require progressive stages of exercises spread over one to two years. We found changing the exercises quarterly helps fight boredom and dropout rates. Employees should know how each exercise teaches proper body mechanics to perform daily activities at work and at home. Finally, conducting frequent audits keeps the program on track, supervisors participating, and provides middle and senior management with objective performance measures (leading indicators).

Using this model, measurable results can be expected. With very few exceptions, at baseline flexibility testing, only ten percent of the employee populations we tested scored in the “Good to Excellent” category or low risk for MSDs (refer to Exhibit 8). By the end of the year, 60 percent test in the “Good to Excellent” category, and the rest improved at least one level. Organizations using these systems have seen significant reductions in MSDs, especially back injuries.

After testing thousands of employees’ flexibility, we found the Total Body Rotation test had too many confounding variables and did not accurately measure trunk rotation. To solve the problem, a chair was designed and a new causation of chronic LBP was discovered. Restricted trunk rotation, in a seated position, showed a high statistical significance in the difference in degree of trunk rotation between those who report chronic LBP and those who don’t. This correlation needs further substantiation; however, the importance of this discovery cannot be underestimated. After headaches, LBP is the second leading cause of neurological ailment (NINDS, 2006). Not only does LBP hurt physically, but mentally, emotionally, and at times financially. Applying these five processes as part of an injury prevention program places safety professionals in a strategic position to not only reduce MSDs but also improve the lives of everyone in the organization (Haight, 2008).

(Note: This article was originally published in *Professional Safety*, June, 2012 (Drennan, Edwards, 2012.)

## Bibliography

- Andersson G., Chaffin D., & Martin, B. 1999. *Occupational Biomechanics*. New York: John Wiley & Sons.
- Centers for Disease Control and Prevention: *Chronic Diseases. The Power to Prevent, The Call to Control: At A Glance 2009*. Retrieved December 2011, from <http://cdc.gov/chronicdisease/resources/publications/AAG/chronic.htm>.
- Drennan, F., & Edwards, R. “Preventing Musculoskeletal Disorders – Five Essential Processes to Build a Fit Workforce.” *Professional Safety*, Jun. 2012, p. 53.
- Drennan, F., & Richey, D., Ph. D. “Skills-Based Safety Leadership: Redefining the safety role of the first-line supervisor, Part 1.” *Professional Safety*, Feb. 2012: 59-63.
- Drennan, F., & Richey, D, Ph. D. 2006. “Integrating Employee Safety & Fitness: A model for meeting NIOSH’s Steps to a Healthier U.S./Workforce challenge.” *Professional Safety*, Jan. 2006: 26-35.
- Forsyth L. & Marcus, B. 2003. *Motivating People to Be Physically Active*. Champaign, IL: Human Kinetics.



- Goetzel, R. 2004. "Examining the Value of Integrating Occupational Health, Safety, and Productivity Management Programs in the Workplace, Parts 1 and 2." Presentation at Steps Symposium. Washington, DC: U.S. Department of Health and Human Services, CDC, NIOSH, 2004. [http://www.cdc.gov/niosh/steps/2004/white\\_papers.html](http://www.cdc.gov/niosh/steps/2004/white_papers.html) Retrieved 2006.
- Haight, Joel, ed. 2008. *The Safety Professionals Handbook*. Des Plaines, IL: American Society of Safety Engineers.
- Hoeger W. & Hoeger S. 2011. *Lifetime of Physical Fitness & Wellness: a personalized program*. Belmont, CA: Wadsworth Cengage Learning.
- Lipman, Marvin, MD. 2012. "Top 10 Health Tips for 2012." *Consumer Reports*, 13.
- NINDS (National Institute of Neurological Disorders and Stroke). 2006. *Low back pain fact sheet*. (Retrieved January 2012 from [http://www.ninds.nih.gov/health\\_and\\_medical/pubs/back\\_pain.htm](http://www.ninds.nih.gov/health_and_medical/pubs/back_pain.htm).)
- NIOSH. 1998. "Musculoskeletal disorders and Workplace Factors: A critical review of epidemiologic evidence for work-related musculoskeletal disorders of the neck, upper extremity and low back." Atlanta: U. S. Department of Health and Human Services (CDC).
- Whiting, W. & Zernicke, R. 1998. *Biomechanics of Musculoskeletal Injury*. Champaign, IL. Human Kinetics.