

Reducing Musculoskeletal Injuries via Innovative Wellness/First Aid Solutions

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Introduction

Employers in virtually every industry contend with musculoskeletal injuries (MSD's, CTD's, RSI, RMI's) that may become costly, recordable, and challenging to manage. In today's corporate environment, virtually every employer has or will soon have an aging workforce. Soft tissue conditions alone can be a significant problem, but add in the potential challenges of a growing, aging workforce and we have a bit more to contend with these days.

Over the last 17 years, the author and his colleagues have worked in clinical settings, in training rooms with collegiate and professional athletes, and in 210 manufacturing or service related industrial facilities, designing and implementing unique initiatives to reduce soft tissue strains and repetitive stress injuries. Listening and learning from employees in the trenches, and working with health and safety professionals, ergonomists, benefits and HR managers, health-care professionals, and government agencies has proven essential in developing effective musculoskeletal initiatives that render positive results while being mindful of governmental rules and regulations.

Participants in this presentation shall understand the nature and causation of soft tissue disorders, while realizing cost-effective mechanisms through which to halt and reverse the process. Learn how a multitude of small to large employers have succeeded in their efforts in reducing recordable injury rates, lost time, and associated medical expenses, by implementing muscle and joint wellness and first aid programs that professional athletes and teams have known about for years.

Prior to proceeding, I would like to preface this writing with an opinion statement, that a quality ergonomics program should be the cornerstone of preventing workplace musculoskeletal injuries. The programs and initiatives discussed in this paper should be viewed as a complement to an ergonomics program.

Why soft tissue injuries are so misunderstood

Strains, sprains, and repetitive stress injuries tend to all fall into a single classification in the Health and Safety community and are collectively referred to as MSD's or musculoskeletal disorders or injuries. The term, "soft tissue injuries" is often used to address such conditions as well. Regardless of the name or the mechanism in which such injuries occur, the end result, which impacts the individual employee, is pain. Pain may come in the form of tingling,

numbness, shooting, stabbing, throbbing, aching or a combination of these. There are many levels of pain that an individual may face. The first challenge in dealing with issues involving pain is that pain is subjective and only the individual experiencing it really knows that it is there and how severe it is. The second challenge is actually discovering the internal source of the pain. Fibrosis or scar tissue formation on or in between muscles (or other soft tissues) is often a primary culprit in many MSD's seen in industry.

There are particular tests commonly used by health care professionals to recreate classic symptoms. Let's take carpal tunnel syndrome as an example: "In the Tinel test, the doctor taps on or presses on the median nerve in the patient's wrist. The test is positive when tingling in the fingers or a resultant shock-like sensation occurs. The Phalen, or wrist-flexion, test involves having the patient hold his or her forearms upright by pointing the fingers down and pressing the backs of the hands together. The presence of carpal tunnel syndrome is suggested if one or more symptoms, such as tingling or increasing numbness, are felt in the fingers within 1 minute. Doctors may also ask patients to try to make a movement that brings on symptoms." (NINDS 2012) When conditions escalate to more severe levels, most payer entities (insurance companies) will require a more objective validation that a nerve entrapment or compromise exists. This is done with an electro-diagnostic test or nerve conduction velocity (NCV) test. Although this is a respected form of evaluation, both false positive and false negative results can occur.

X-rays are more relevant for fractures and in determining if arthritis exists. Particular types of ultrasound machines can demonstrate nerve movement, but the reality is that most doctors' offices do not possess such sophisticated ultrasound devices. MRI reveals the anatomy of a region but has not proven to be effective in determining the exact location of particular entrapments. Some practitioners believe this to be due to scar tissue having very similar water density to the structures around it. So two muscles or even a nerve may be entrapped by an adhesion, comprised of scar tissue, yet the MRI depicts this as part of the muscles.

So what all of this means is that demonstrating that scar tissue or an impingement exists is not easy. Fortunately today, manual soft tissue therapies have become much more main stream and accepted both in clinical and corporate settings. In fact OSHA recognizes massage as a component of its permitted forms of first aid (OSHA 2001).

Over the past 20 years particular providers of soft tissue therapies have raised the bar and developed in-depth hands-on soft tissue palpatory evaluations in which tissue textures are taken into consideration, in conjunction with traditional evaluation processes. The common trend reported by such therapists is that scar tissue has a unique texture that can be felt, by an individual with a well-developed sense of touch. So, what doesn't always appear on an imaging device may be identified via a hands-on evaluation involving palpation.

Understanding the causation of common MSD's

Both the Law of Repetitive Motion and the Cumulative Injury Cycle are effective tools to explain how muscle and soft tissues can become compromised with scar tissue, leading to impingements and pain.

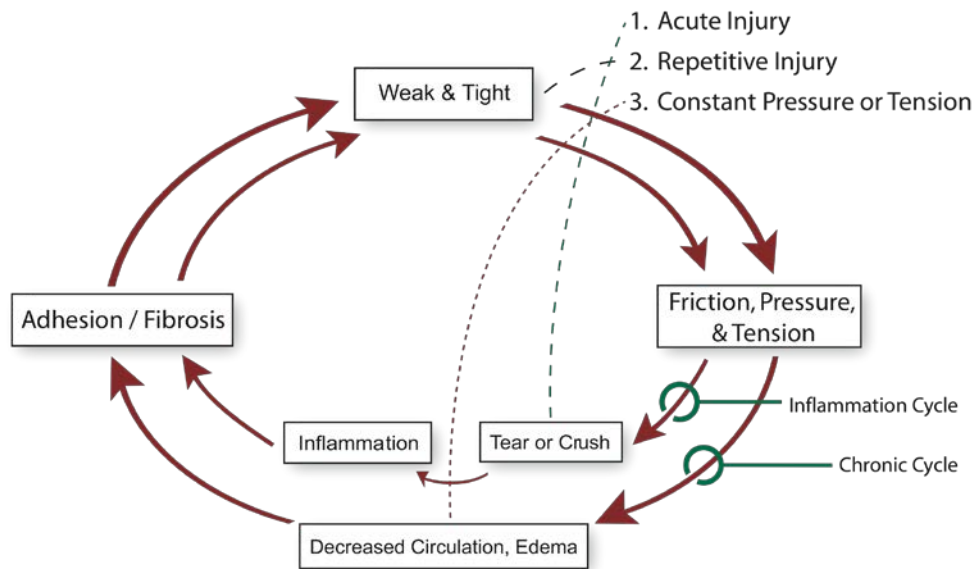


Exhibit 1. The Cumulative Injury Cycle: How RSI's and strain/sprain injuries occur. (Leahy 2008)

The diagram shown in Exhibit 1 demonstrates how scar tissue develops via repetitive stress or strain/sprain. With repetitive stress, the individual is usually performing a repetitive task in a compromised position. The muscles and soft tissues are under increased friction, tension, and pressure for extended periods of time. When certain areas of the body are under such prolonged compression and stresses, there is a decrease in the blood circulation to the area, resulting in a decrease in oxygen delivery. When this occurs at a particular pressure level, a series of chemical reactions takes place, resulting in the development of scar tissue adhesions (fibrosis). The fibrotic tissues cause muscles to become compromised, tight and weak. The cycle continues and tends to become worse with time.

When an individual suffers a true strain or sprain, this cycle begins with the tearing or crushing of the tissues, followed by inflammation. Once the condition enters the healing process, the scar tissue begins to develop and the cycle continues, as with a repetitive stress condition. The only way to stop the cycle is to effectively release or remove the adhesion with an effective intervention.

$$I \approx \frac{NF}{AR}$$

- I: insult to tissue
- N: number of repetitions
- F: force required to perform a repetition
- R: relaxation or rest between repetitions

Exhibit 2. The Law of Repetitive Motion. (Leahy 2008)

The Law of Repetitive Motion, as shown in Exhibit 2, details the four primary factors that contribute to the development of an injury or “Insult” to the tissues.

In an industrial setting a health and safety professional and/or ergonomist will strive to manipulate these factors to reduce the “T”. The “N,” or number of repetitions performed by an employee is not always easily reduced, without negatively impacting production, but it is commonly advised to rotate jobs so that the “N” can be lessened. Reductions of the “F” (Force) may be accomplished with ergonomic modification, when possible. Some companies, Such as General Electric in Arkansas City, KS, have developed strengthening programs for employees to fortify particular joints and increase the employees’ ability to render the needed Force more easily. The “A” for amplitude, is a factor that can be challenging to modify. Smaller repetitive movements tend to yield more repetitive stress conditions, where large movement (greater amplitude) yields fewer. The Amplitude can be manipulated with ergonomic improvements, when possible. The “R,” which stands for rest, tends to be the simplest and most cost-effective factor to manipulate. Rest does not necessarily mean being passive. An effective form of Rest can be accomplished via, micro-break stretches, designed specifically for muscle groups, used by the employee during a repetitive task/job. By placing muscle groups in opposite, or simply different positions, it is believed that muscles and joints stay loose and an improved supply of oxygen rich blood will reach the region, decreasing the likelihood of scar tissue formation. (Johnson 2011)

Successful MSD Halting Interventions

In 2002 an EH&S professional, Mary Betsch, was working at an electronics manufacturing plant, Sanmina-SCI, in Fountain, Colorado. At the time this facility employed approximately 1100 individuals. The nature of the work was physical and considerably repetitive. This facility did strive to improve by investing significant dollars, time, and efforts in ergonomic improvements, but were still experiencing high injury rates, greater than 10 OSHA recordable injury rate, and in excess of \$875,000 in workers’ compensation claims in a single year with the majority attributed to MSD’s. At Sanmina-SCI the employees that performed the more physically demanding jobs were often referred to as “industrial athletes.” So when the traditional interventions simply weren’t delivering the desired outcomes, Mary Betsch chose to look outside the box and turn to athletics. Mary began investigating what professional athletes and sports teams were doing, from a soft-tissue standpoint, to keep their athletes functioning and performing optimally. Surely these individuals were highly motivated and required by their profession to exercise and do strength training, but the nature of their jobs also frequently resulted in overuse injuries and strain/sprains. What Mary found to be consistent was that the majority of the athletes or teams’ training-staff utilized soft tissue bodywork and massage, of various types to release or free muscles, tendons, and ligaments from being adhered together with scar tissue. Mary sought out approvals from her facility upper level management and guidance from local OSHA representatives and moved forward with designing and implementing a preventative program, which incorporated very specific soft tissue massage to maintain the muscle and joint systems of her workforce. Rather than solely reacting to injuries, Sanmina SCI utilized soft tissue therapies to prevent injuries. Employees were educated about the type of therapy that was made available and encouraged to utilize the service periodically from a joint and muscle “Well-check” standpoint. Employees would visit the soft tissue provider and explain about the regions of the body they utilize regularly throughout the day. The providers also visited the job sites and witnessed the movements and the muscle groups that were required, which gave them an improved understanding of the employees’ physical challenges. Then during a very brief preventative therapy session the provider would work on the joints and specific muscle groups that the employees utilized the most, while on the job. The soft tissue providers were viewed as maintenance technicians, but for the employees’ muscular and joint systems. A significant amount of the program was preventive and employees were even encouraged to utilize the soft tissue program for non-work related discomforts that arose from posture, sleeping positions, sports, or hobbies, since these activities can cross over into the workplace, impacting performance and productivity, or may become a work related condition.

This form of massage was also offered as a first aid care option to employees with minor, early in onset, tolerable discomforts that had not crossed the OSHA recordable injury threshold. In having this care-option available to employees it became simple and comfortable for employees to report discomforts early and frequently; such cases were prevented from escalating to more significant levels. Because data was captured on every employee case, Betsch was able to focus on continued ergonomic improvements at a more specific level. Preventative micro-break stretching programs, to promote circulation were also implemented. This facility realized greater than a 70% reduction in both MSD related soft tissue recordable injuries and expenditures from a workers' compensation claim standpoint. OSHA auditors also recognized Sanmina's use of such soft tissue therapies as a best management practice.

Important notes regarding preventative soft tissue programs and exercise based initiatives.

Prevention is the ideal.

- Put emphasis on utilizing your soft tissue provider to keep your work force's muscular and joint systems well.
- When using a soft tissue therapy, from a reactive standpoint as a first aid offering, make sure the type of soft tissue therapy, is an accepted form of "massage" by the Department of Labor. If the employee's condition is mild and tolerable and has not exceeded the OSHA recordable threshold, then the massage may be used as a first aid option.
- Exercise in the form of stretching programs and or strengthening should be preventative in nature. OSHA interpretations state that if either stretching (OSHA 2011) or strengthening (OSHA 2010) is taught, coached, or instructed to employees in response to a work-related musculoskeletal discomfort, injury, or occurrence, it is considered a form of therapeutic exercise and therefore physical therapy which would result in an OSHA-recordable injury.

Implementing a strengthening program

Many corporations today have exercise-wellness facilities on-site, but such offerings tend to be the minority. In most industries, other than the military, you cannot require employees to exercise. But you surely can provide the tools, influence, and motivation to employees.

In 2009 a GE facility in Arkansas City, KS chose to implement a shoulder (rotator cuff) and core (hips, low-back, abdominal) strengthening program. This facility's EH&S professional, Tami Norwood, looked to the Law of Repetitive Motion and viewed the "F" (force) factor from a unique standpoint. She, with her management's support, sought to provide employees with a system to increase employee's strength in areas that employees use the most and historically where injuries, anatomically, were more likely to evolve. Norwood's goal was to provide employees with the resources and training to increase their ability to provide Force in their weaker regions, both fortifying these structures while decreasing the "I" (insult to tissues). This facility commissioned an exercise physiologist to assist with designing a very brief (10 minute) strengthening routine that employees could perform twice per week. This professional also assisted in designing a low-tech and low-budget exercise area. The routine developed involved only 3 to 5 exercises (performed during brief sessions), and these activities targeted the core region and the shoulder's weakest links. The types of exercises were quite different from what most health conscious individuals perform in a gym setting. Even the more fit employees admitted that such exercises were neglected in their traditional strength-training routines. The focus was to strengthen the ancillary or small more-injury prone soft tissue structures. Most shoulder and rotator cuff, exercises were performed with various density exercise bands, connected to the wall at number of angles. The core exercises were primarily performed on a mat on the floor, or an exercise ball, using one's body weight. All exercises were performed in a slow and controlled manner. Over 50 exercises were provided to each employee in a workout book and the exercise routine changed every 3 weeks, so that joints and muscles were continuously

challenged and routines did not become stale.

Employees that elected to take part did so on a voluntary basis and were required to go through a formal training and consultation with the company nurse, prior to starting. Due to time and budgetary constraints employees were required to take part “off the clock.” This did not deter employees from taking part. Employees came in to work 10 minutes early or utilized part of their breaks to exercise. The interest level became so great that the space was expanded so that more employees could participate. This facility also had a strong ergonomics program and a regularly scheduled soft tissue massage offering, so this exercise program was viewed as a leg, or portion, of the companies MSD prevention efforts, so no individual metric was placed on the program. The opinion of the management was that if the employees would embrace exercise, and physical self-fortification, then some level of support and resources would be provided.

Tips for implementing a strengthening program

1. Keep it simple. A low budget program can be quite effective. You can do a lot with simple inexpensive equipment (mats, exercise balls, bands).
2. Target your workforce’s weakest links (parts of the body).
3. Have a program developed by and exercise professional. Make there be enough variety so that it doesn’t become boring.
4. Provide a workout booklet to track progress (this can be produced with the assistance of the exercise professional). Possibly offer a prize to those who complete a 3-month program, each time they finish.
5. Have a healthcare professional screen the participating individuals prior to start and make sure your legal department provides proper liability forms to participants.
6. If possible have healthcare providers capture baseline data such as grip strength, joint ranges of motion, and isometric hold times. This data can be used to show individuals strength and endurance improvements over time (or simply compared to normative data).
7. Have a formal deployment and orientation program in place where participants are trained properly in all exercises and how to log their exercises.
8. Provide and collect feedback questionnaires. Employees will let you know how much they appreciate such offerings and such feedback can be helpful in continuing and even increasing such programs in the future. Improvement or changes can also be addressed from this feedback.

Ground-Up Ergonomic Complements

A large percentage of manufacturing, service, or construction companies require employees to work on their feet. Much study, interventions and improvement have been put on prevention of slip and falls as well as proper lifting or material handling. New trends in both lifting-training as well as general work-performed-while-standing are focusing on the foundations of our bodies = our feet, ankles, and leg positioning.

A traditional lift involves a shoulder width (or slightly wider) squat which transitions into a standing position. Depending on the awkwardness of the object being lifted, this often leads to the upper body leaning forward, compromising one’s center of gravity.

From an engineering standpoint, a wider foundation tends to provide greater stability of a structure. This philosophy has transferred over to material handling. The majority of proper lifting guidance has remained the same with one change. Some call it a “Sumo” stance. It simply involves a wider stance with toes slightly outward. Exercise and biomechanics professionals are finding that such positions allow for more quadriceps, gluteal, and hip involvement with less low

back compromise and less forward lean compromise. Various professional groups exist that consult with safety professionals in designing such wide-stance material handling programs, specific to each industry. Although the concept is relatively simple, it is recommended that each job description and the materials being handled, be evaluated to determine appropriateness and the most ideal manner in which to apply a wide stance lift. **Note:** This lifting method is still considered relatively new, so it is not formally recommended by government agencies.

Ankle alignment and its relevancy to injuries

As health and safety professionals we are often expected to manage ergonomic modifications involving workstation set-up, tools, and processes. But what if the employee comes to work with a physiological issue that is so common that we perceive it as normal? What if that issue makes that employee more susceptible to injury? This is actually very common with our feet and ankles.

Before going any further it is important to understand a few terms that describe the shape or tendency of ankles. When looking straight on at the front of your lower legs and feet, with your feet aimed forward if you notice that your ankles bow outward, this is called supination. If the ankle bows inward it is called pronation. If the ankle is relatively straight this is called neutral. When an individual has a pronation or supination it tends to become more significant during a dynamic movement phase such as walking or squatting. Having ankles that pronate is quite common. Ankles that supinate are less common, but still a significant population has this. When an individual possesses either, or a combination of both, this usually is accompanied by foot, knee, hip or low-back pain. This compromise can and does put an employee in a weaker and less than optimal starting point, prior to the workday even beginning. When one bends or squats and their kinetic chain is not well aligned the chances for injury escalates. Improving or correcting this issue is actually fairly simple and affordable. Many companies provide some sort of footwear financial support to employees. Often the thought is solely to provide a durable shoe or boot with particular protections, such as steel toes. Quality insoles now exist that provide support in the form of a raise or lift, to lateral or medial aspects of the heel. This results in correcting of a pronation or supination of the ankles, which often assists in aligning knee movements and leveling the hips. Collectively this allows the individual to stand, walk, climb stairs, or squat in a state of proper (or improved) alignment. This also translates to greater comfort, strength, power and endurance. Note: There are numerous suppliers of such insoles. Some will provide complete evaluations of a workforce as part of their service. Such insoles are not to be confused with orthotics, which are traditionally custom made (with a mold or foot scan) by a health care provider.

Conclusion

Every facility has different challenges from a musculoskeletal standpoint. At some facilities the concern is that the employees are sedentary, while in others, the movements and physical/repetitive demands take their toll on the workforce. Fortunately, today there are many fine interventions, wellness programs and ergonomic modifications to choose from to help minimize the exposures and related expenses of soft tissue conditions. The intent of this paper is to share some health and safety professionals' innovative experiences and outcomes and to enlighten the reader about relatively new concepts that may be applicable to your workplace.

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